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A CURABLE AND PREVENTABLE DISEASE

LAWRENCE F. FLICK

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CONSUMPTION

A CURABLE AND PREVENTABLE DISEASE

WHAT A LAYMAN SHOULD KNOW

CONSUMPTION

A CURABLE AND PREVENTABLE DISEASE

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BY

LAWRENCE F. FLICK, M. D.

FOUNDER OF THE
PENNSYLVANIA SOCIETY FOR THE PREVENTION OF TUBERCULOSIS; PRESIDENT OF THE FREE HOSPITAL FOR POOR CONSUMPTIVES OF PENNSYLVANIA; MEDICAL DIRECTOR OF THE HENRY PHIPPS INSTITUTE FOR PREVENTION AND STUDY OF TUBERCULOSIS

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WITH ESTEEM AND AFFECTION THIS LITTLE VOLUME
IS DEDICATED TO

HENRY PHIPPS, ESQ.,

WHO BY HIS GENEROSITY AND INTEREST HAS
LAUNCHED THE CRUSADE AGAINST TUBERCULOSIS ON
BROAD OPEN WATERS.

PREFACE

Since the first edition of this book was given to the public much progress has been made in the crusade against tuberculosis. The public has been enlightened on the salient points about tuberculosis and many practical measures for treating those who are suffering from the disease and protecting those who are still free from it, have been put into practice. Some mooted points about the disease which have a practical bearing upon the prevention of it have been cleared up. However, there is still a great deal of error about the disease in the public mind, and in consequence, unnecessary fear of it and of those who are afflicted with it still prevails. Public enlightenment will gradually do away with this fear.

Necessary changes have been made to bring this revised edition up to date in science and practice, and in accord with established facts and accepted modes of procedure.

LAWRENCE F. FLICK.

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INTRODUCTION

WHEN Pasteur gave the world his great discovery that fermentation is due to life, he blazed the way for exact knowledge about disease which since has been pursued with great success. From the knowledge that fermentation was due to a living organism to the theory that disease was due to a living organism was but a step—and a step easily taken, inasmuch as some men had already suspected that disease was but an episode in organic nature. Well-directed research soon displaced theory with fact.

Pasteur himself was the first to extend his discovery into the domain of disease by demonstrating that disease which affected wine was due to the parasitic life of minute organisms so small as to require a powerful lens to reveal them to the naked eye. Next, he was able to show that disease

which destroyed the silk worm was likewise due to the parasitic life of micro-organisms, as such minute living things came to be called. Other laborers entered the field, and one by one diseases yielded up their secrets.

We now know the definite cause of many diseases, each a microscopic organism endowed with life and the essential qualities of all living things. These are birth, growth, reproduction, and death. Of some diseases the cause still lies hidden. We have not yet been able to bring to light the organisms which produce them although by analogy we have good reason to believe that such organisms exist. In time we will know all.

The new knowledge about disease which has come into the world is destined to revolutionize everything. The microscope is making us acquainted with a kingdom in nature which we did not dream of before, and which is as important for the mainten-

ance of the existing state of things as are the animal and vegetable kingdoms.

This kingdom is a veritable fairy land. Its inhabitants are more numerous than the sands of the sea, and as varying in their functions as are the inhabitants of the animal and vegetable kingdoms. They are all so minute that they cannot be seen with the naked eye. Some of them have functions which are useful to us, and some have functions which are prejudicial to us.

Many of the wonderful phenomena in nature which in the past have been mysteries to us are caused by denizens of this kingdom. Indeed, only a few of them work serious harm to man, and even the harm which these do is not out of harmony with nature as a whole.

The world as we see it can be maintained only by harmonious succession of life and death. The animal and vegetable kingdoms to a great extent depend each upon death in the other for the mainten-

ance of life, and the microscopic kingdom which is now being revealed to us seems to stand in the relationship of go-between, transforming each into food for the other.

It is quite possible that the micro-organisms which now produce what is known as disease originally only attacked dead organic tissue. Their primary function may have been to transform dead organic matter into inorganic matter. As living organic matter degenerated, thus approaching nearer and nearer to dead organic matter, they gradually may have acquired the power of growth upon living organic matter. Such a theory is the more plausible since we know that all micro-organisms which cause disease find congenial soil in a living organism in direct ratio to deterioration of the latter from a normal standard.

If man by reason of his deviation from the laws of nature through self-will has brought disease upon himself he has the

power in the intelligence which God has given him likewise to rid himself of such disease. This power now becomes available for the first time in the history of the world through the new knowledge about the microscopic world. The micro-organisms which work harm to man can be singled out and destroyed. This is the task which science presents to man for the twentieth century.

Consumption, from the dawn of history to the present day, has been one of the worst scourges of mankind. Not only has it afflicted man himself but every kind of brute creation with which man is closely associated. It strikes at man's life in a way that brings mental anguish as well as physical suffering, and it deals him out sorrow and want when it cannot reach him with death. It has been a shackle to his progress in civilization, a mildew upon his physical evolution, and a leaven of decay to his morality. In the past it has shown

itself an unconquerable foe. What a victory for the human mind at last to have brought this enemy to bay!

Science has laid before the world the cause of consumption with mathematical exactness, and has given such an insight into the lives of the micro-organisms which produce it that it is possible to plan a campaign against the disease which is sure to end in victory for the human race. It now remains for the world to avail itself of the knowledge which science has given it, and for every man, woman, and child to enlist in the army which is to fight the battle. This little volume is sent forth to seek recruits and prepare them for the crusade against this disease.

CHAPTER I

What Consumption is

CONSUMPTION is a disease which is caused by the growth of certain micro-organisms in the tissues of our bodies. These micro-organisms grow in us in the same way as wheat, timothy, and clover grow in a field. The micro-organisms concerned with the production of consumption are the tubercle bacillus, the streptococcus, and the staphylococcus. The tubercle bacillus is the chief or head of the house, and the streptococcus and staphylococcus are associates.

Consumption is a complicated disease, or, perhaps more correctly speaking, a mixture of diseases. The picture of human suffering, distress, and bodily decay which we recognize as consumption has been named

for its most striking symptom—waste of the body.

The word consumption means burning up—destruction. In all ages and in all languages the disease has been named for this symptom. The Greeks called it phthisis, which means wasting. This name is still retained by the Latin races and to some extent is used in English. The Germans call it Auszehrung, which likewise means wasting. The disease is accompanied with burning fever and profuse sweats. These symptoms quite naturally give a fitting background to the picture of consumption or destruction. The body is melted away under the consuming fire. A racking cough goes with the disease and helps in the work of destruction by carrying off the wasted tissue. The hectic flush is but the glow of the burning fire within.

In olden times consumption was looked upon as a simple uncomplicated disease,

beginning and ending with the same symptoms. Nothing was known of its cause and there were all kinds of surmises as to what it might be due to. Hippocrates thought it came from some subtle poison generated in the air and carried by certain winds. No doubt this was the accepted opinion of his day.

In countries in which very cold weather occurred during winter and in which rapid changes of temperature took place in summer, it was ascribed to cold. This opinion still is held by many. In more modern times most people have attributed the disease to an inherited tendency to decay. It is quite possible that this view sprang from a strained interpretation of the Bible where it speaks of the sins of the father being visited upon the son to the third and fourth generations.

For all of the strange views about the disease held in the past plausible reasons could be found in the course which the

disease ran from its beginning to its end as then understood. But as only the end of the disease was recognized, all reasoning upon its source, being based upon incomplete observation, necessarily was false.

Consumption now is known to be a complicated disease of very long duration, which, like the butterfly and many other insects, looks different and acts very differently according to the stage of its existence. During its pupal stage, when it is known as merely tuberculosis, it is hard to detect, because it creates so little disturbance as not even to attract the attention of the person afflicted. It may exist in this stage for many years.

Usually it is brought to light by some such micro-organism as the influenza bacillus, the pneumococcus and the micro-organisms which cause what are commonly termed "colds." As a rule, it is through one or the other of these micro-

organisms that the streptococcus and staphylococcus are introduced to it; and generally it is during the struggle of one's system against these micro-organisms that the wicked partnership between the tubercle bacillus and the streptococcus and staphylococcus is formed. It is only after the formation of this partnership that true consumption exists and becomes recognizable to the layman. Even the average physician does not recognize it earlier.

The striking symptoms of consumption which attract the attention of everyone are due to the poison produced by the streptococcus and staphylococcus. This poison is absorbed into the blood and affects the nervous system.

The streptococcus and the staphylococcus are micro-organisms which occur almost everywhere in nature. They look like little balls strung out in chains or bunched like grapes, and are given their respective names because of their respec-

tive resemblance to these objects. When they get into the tissues of the body, they break down these tissues into pus. Fortunately they are unable to attack normal tissue. It seems that they cannot even gain admission into a living organism except through tissue which has been injured either by the application of physical force of some kind or by the growth of some other micro-organism.

CHAPTER II

What Tuberculosis is

TUBERCULOSIS, scientifically speaking, is the implantation and growth of the tubercle bacillus in the tissues of a human being or an animal. The tubercle bacillus is a rod-shaped micro-organism, about one-six-thousandth of an inch in length and about one-hundred-thousandth of an inch in thickness.

Naturalists place the tubercle bacillus in the vegetable kingdom. Bacteriologists, as the men who study the forms and habits of micro-organisms are called, classify it as a facultative saprophyte. By this is meant that the micro-organism usually exists as a parasite upon a human being or some animal, but that it has the power of growing upon such substances as gelatine, boiled potato, and the like, when proper

conditions of temperature, light, and rest are given it.

A saprophyte is a micro-organism which grows upon dead organic matter. A parasite is a micro-organism which grows on living organic matter. This living organic matter is called the host. Only when the tubercle bacillus grows as a parasite in the tissues of a human being or animal is the process termed tuberculosis.

The word tuberculosis is derived from the little Latin word *tuber*, which means a root or lump. It came to be applied to the disease which it now designates by reason of the manner in which certain facts about the disease gradually came to light.

When men began to make autopsies on people who had died of consumption, they were surprised to find in those parts of the lungs which had not been completely destroyed little lumps, ranging in size from a millet seed to a hickory nut. These little lumps were found in larger numbers in

some cases than in others, but they always were present. It was noticed, too, that the little lumps were sometimes hard and sometimes soft. The thought at once suggested itself that the hard lumps, the soft lumps, and the holes or cavities which also were found, all were stages of the same process and that the beginning of every case of consumption was the formation of these little lumps.

In the scientific language of that day, which was Latin, the lumps were called tubercles, and the process which took place in the tissues was called tuberculosis. As consumption was looked upon as an outward manifestation of the process which was going on inside it came to be known among scientific men as tuberculosis. Gradually the laity likewise took up the name, and tuberculosis and consumption came to be known as the same thing.

Tuberculosis, in a popular sense, is not a disease. Disease means want of ease or

comfort, and in common parlance is only used to describe a condition of health in which the affected person knows that he is sick. From a physician's point of view tuberculosis is a disease.

No difference how small the implantation of tubercle bacilli may be in a person, it sets up symptoms which can be recognized by an expert. These symptoms are deviations of functions from the normal, but often they are so slight and have come on so insidiously that the transition from the normal to the abnormal is overlooked by the patient and his friends. This oversight takes place the more easily because many of the symptoms of tuberculosis occur in everyone's life as the result of occupation, use of improper or badly prepared food, and residence under unhealthy environment.

Inaptitude for occupation and fatigue upon slight exertion, dyspepsia, malnutrition, sensitiveness to cold, want of appetite,

dislike of certain kinds of food, irritability, peevishness, and mental depression all are symptoms which may manifest themselves in tuberculosis, but they also are the common inheritance of mankind in the vicissitudes of life and by most people are looked upon as natural results of conditions of life over which they have no control.

When any or all of these symptoms occur in tuberculosis they are only part of a picture which, like the puzzle picture in the newspapers, must be filled in by careful search for other symptoms which exist, but do not show themselves. Some of these hidden symptoms can be discovered by a layman, others only reveal themselves to an expert. The symptoms discoverable to a layman which arouse the strongest suspicion of tuberculosis are loss of weight, slight increase in pulse-rate, and slight depression or rise of temperature.

CHAPTER III

The Relationship between Consumption and Tuberculosis

POPULARLY speaking, consumption and tuberculosis are one and the same thing. Scientifically, they differ quite materially. In the interest of the crusade against tuberculosis it is important that the relationship between the two be well understood by the people.

With the knowledge which is now in the world, among the people, tuberculosis nearly always terminates in consumption. The transition is so gradual as to be imperceptible, and usually it is only when consumption has set in that the existence of tuberculosis is revealed. Practically, therefore, there is but one disease, the

beginning of which goes unrecognized, and in the minds of most people is a mere fiction.

Tuberculosis is caused by the implantation and growth of the tubercle bacillus. By itself this micro-organism does little harm and rarely causes death. Could the streptococcus and the staphylococcus be kept out it would run slowly through the lifetime of an individual without serious consequences.

Its growth in the tissues, however, invites the streptococcus and staphylococcus to those tissues by the injury which it does to them. Sooner or later these micro-organisms run the gauntlet of the sentinels which nature has set up to keep them out, and get into the system. They at once associate themselves with the tubercle bacillus and form a partnership for mutual advantage and the destruction of the individual on whom they prey. The partnership is consumption.

The streptococcus and the staphylococcus are essential co-efficients to the tubercle bacillus for the completion of its cycle of life. Without them the tubercle bacillus probably would soon become extinct. They do for the tubercle bacillus what frost does for the chestnut, enable it to escape from imprisonment so that it may again start on a new cycle of life. They also make a caché for it so as to protect it against its many enemies, especially air and sunlight, and thus preserve its life until it can by some chance be carried into new soil.

The little tumors or lumps which are formed in the tissues by the growth of the tubercle bacillus consist of cells, tubercle bacilli, and debris. The inside of the little tumor may soften, but the little lump remains more or less firm, and the tubercle bacilli are imprisoned.

When the streptococcus and staphylococcus gain admission into the little tumor, they at once begin a work of destruction

of the cells and produce the broken-down tissue which serves as the covering for the tubercle bacillus. An ulcerative process also is begun by these associates, and an opening is gradually made by which the tubercle bacillus again gets into the outside world.

It is during the time when the tubercle bacillus is set free from its imprisonment that the symptoms prevail which give us the picture of human suffering known as consumption. Thus the enfranchisement, the marriage feast, so to speak, of this invisible bit of bioplasm becomes the sorrow and sore affliction of the highest representative of organic life on earth. How interdependent is all organic life!

The first implantation of the tubercle bacillus, even when followed by an implantation of the streptococcus and staphylococcus, rarely gives rise to a full-fledged consumption. It may give rise to a process so slight as not to attract attention during

any part of the course through which it passes.

When the first tubercle matures and the bacilli are set free and come away, there is a slight cough, a few night-sweats, perchance, indisposition for a week or two,—a miniature consumption, so to speak, but so trifling and brief as to pass for a cold.

During this process, however, a new seed-scattering takes place, a new implantation follows, a larger growth ensues, and with the second harvest more pronounced symptoms occur. The interval between the two processes is so long as to obliterate the first from memory before the second comes on. A third seed-scattering takes place with the same sequences as the preceding two, and again with a larger area of implantation than the one immediately going before.

Attack after attack comes on at intervals of longer or shorter duration, varying from three months to a year, each severer

than the one before, each a miniature consumption and approaching nearer to the real thing than its predecessor, until finally, as with the orange tree, harvest and seed-time meet and there is one continuous consumption which everybody can recognize. Usually, this is the time when the poor deluded victim seeks aid. He knocks at the doctor's door, and the undertaker answers.

CHAPTER IV

What Colds, Influenza, and Pneumonia have to do with Consumption

COLDS, influenza, and pneumonia have been looked upon as causes of consumption and by many still are regarded as such. A neglected cold, repeated attacks of influenza, an unhealed pneumonia, to the lay mind, are highways to consumption, which like the roads to Rome can lead nowhere else. A half truth lies hidden back of these popular notions which looks so like the whole truth as to be misleading.

Colds, influenza, and pneumonia all are caused by micro-organisms, each of which is an independent entity. The micro-organism or micro-organisms which produce colds have not been identified as yet, but

we have every reason to believe that they exist. It is possible that a number of micro-organisms have to do with the condition which is termed a cold. The micro-organisms which cause influenza and pneumonia are known. One is a bacillus, and is called the influenza bacillus; the other is a coccus, and is known as the pneumococcus. These diseases, being caused by micro-organisms, are communicable from one person to another.

Inasmuch as the micro-organisms which produce colds, influenza, and pueumonia are independent entities, endowed with life and the essential qualities of living things, they cannot be transformed into other living things. A micro-organism can only reproduce a micro-organism of its own kind, and therefore a disease caused by one kind of micro-organism cannot give rise to a disease caused by another kind of micro-organism. It is no more possible for a cold micro-organism, an influenza

bacillus, or a pneumococcus to give rise to tuberculosis than it is for a grain of oats to grow into a stalk of wheat.

Nevertheless, the cold micro-organism, the influenza bacillus, and the pneumococcus do play a rôle in the production of consumption which usually is so dramatic as to be readily mistaken for the cause.

A person may have tuberculosis for a long time without knowing it because there are no marked symptoms. Quite suddenly a cold, an influenza, or a pneumonia sets in with a chill, fever, and the most acute indisposition. The person at once knows that he is ill and from the moment of seizure his attention is riveted upon his condition.

Because of the pre-existing tuberculosis, the cold, influenza, or pneumonia does not run a normal course, but shows a strong tendency to chronicity. Finally, as it disappears it leaves in its wake well-developed symptoms of comsumption, which perhaps for the first time bring to light the

pre-existing tuberculosis. How natural for the patient to ascribe his consumption to the most apparent cause.

The part which the cold micro-organism, the influenza bacillus, or the pneumococcus plays in such cases is twofold, that of a fertilizer for the tubercle bacillus, and that of a roadmaker for the streptococcus and staphylococcus.

Colds, influenza, and pneumonia reduce the vital force of the body, and thus make the tissues a better soil for the tubercle bacillus. They also disarm the sentinels which stand guard against the admission of the streptococcus and staphylococcus and often bring these marauders in.

A cold, an influenza, or a pneumonia always is a serious matter to a tubercular subject. These three diseases, figuratively speaking, are the hunting dogs for tuberculosis, because they bring the disease to light when its existence is not suspected. They also are drummers for the strepto-

coccus and staphylococcus and constantly bring trade to them which otherwise they would not get. They are in business for themselves, but they don't mind doing a little commission business on the side. This they can do the better because their own business paves the way for the partnership business of the tubercle bacillus and the micro-organisms for whom they act as agents.

CHAPTER V

What Consumption Means to the World

IT IS beyond the grasp of the human mind to fully realize what consumption means to the world. The disease exists in every part of the habitable globe, upon the surface of the earth, underneath the waters, and in the heavens above. It probably is the direct cause of death of one-seventh of the human species, and a fair percentage of the animal species. It affects the fishes of the sea and the birds of the air.

True knowledge can come only from personal experience. Knowledge of consumption is restricted by the experience of the individual, and the sum total of individual knowledge upon one given subject constitutes public consciousness upon that subject.

Consumption has been a plague upon the earth at all times and in all places, but man never has been conscious of it. This is because the disease is devoid of drama and tragedy.

The individual sees but little of it because his social horizon necessarily is circumscribed. Within the family the disease is a family affliction. It gives no idea of what is going on beyond.

Consumption is a disease of the poor. It lurks in dark corners. No one sees it in the aggregate. Even the clergyman and the doctor see but one case at a time and see relatively few cases in a lifetime.

Could the consumptives of any given community be seen at one time or pass in panorama before the people, public consciousness of the magnitude of the affliction might be aroused. A physical disaster shocks the world and lets loose the sympathy of millions. A few thousand deaths are nothing as compared with the deaths from consumption.

In the United States upward of one hundred thousand people die annually from consumption. In Germany the number of deaths every year is nearly the same; and in France the figures stand very little below. In Austria there are about eighty thousand deaths a year from the disease; in England about sixty thousand; in Italy about fifty thousand. Throughout the world there probably are a millon deaths a year from the disease.

Every community has its litttle army of victims of the disease, but they are seen only in ones and twos and make no impression. Could they be massed and all the armies brought into one composite picture, what a harrowing sight they would present!

The death-rate from consumption does not give a true picture of the ravages of the disease. It does not even tell the truth about consumption. When tuberculosis ends fatally, it usually does so by

way of consumption; but not all deaths caused by consumption are so recorded.

Some of the names under which consumption parades, even with propriety, because of long usage, are quite misleading to a layman. Marasmus, for instance, would hardly be taken for the same disease as consumption, and yet it is. The only difference is in the place of beginning of the micro-organisms. Exactly the same micro-organisms are at work. In marasmus they make their headquarters in the lymphatic glands of the belly; in consumption they make them in the lungs.

When the tubercle bacillus in union with the streptococcus and staphylococcus causes death, by operating in some other part of the body than the lungs and lymphatic glands of the belly, the death usually is recorded under a name which gives no clue to the real cause of death.

Usage has established the practice of recording deaths by a name which indicates

an inflammation of the organ affected by the death-dealing disease. Pneumonia means an inflammation of the lungs; nephritis, an inflammation of the kidneys; meningitis, an inflammation of the lining membrane of the brain; pericarditis, an inflammation of the membrane around the heart; peritonitis, an inflammation of the peritoneum; and pleurisy, an inflammation of the pleura. Nothing is told us by these names about the cause of the inflammation.

The tubercle bacillus, in union with the streptococcus and staphylococcus, frequently is the cause of inflammation of these organs and tissues and, when it is, often leads to death. The death certificate, however, fails to tell about the work of the tubercle bacillus and its associates in such cases.

What consumption means to the world in deprivation, anguish, grief, and degeneration cannot be imagined even. We can take one family which has been afflicted

by the disease, study the course of the disease from beginning to end, contemplate the havoc made and even try to analyze the damage done financially, physically, socially, and mentally, but we cannot read the hearts of those who looked on while the disease was torturing and killing inch by inch a loved one; we cannot measure the longing hope nor fathom the deep despair alternant in the minds of the stricken members; we cannot measure the heroism of those who stood at the post of duty year in and year out, realizing their danger but unable to flee from it; and we cannot know of the misanthropy, envy, and hatred engendered, and perhaps virtuously withstood, whilst helplessly the stricken family stood in the shadow of affluence and wealth.

Who can understand the mental anguish created by a fancied remedy for a fatal disease, withheld by poverty in the midst of plenty, except he who has drunk the dregs of such poverty?

CHAPTER VI

The Prevalency of Tuberculosis

THE denizens of the microscopic world, although beyond the reach of the naked eye, usually can be seen through their work. What they accomplish manifests itself in material form or sets up changes in material things which can be recognized. As yet, however, man is not well enough informed about the micro-organic world to be quick in detecting all the phenomena which emanate from any given member of that world.

Tuberculosis as a manifestation of micro-organic life is not well understood as yet. To the minds of most men the word tuberculosis merely conveys the idea of consumption. Men know consumption but do not know tuberculosis, and as consumption

grows out of tuberculosis its manifestations are unconsciously ascribed to tuberculosis. The tuberculosis is overlooked because it is sought for in the dress of consumption, just as a larva would be overlooked when sought for in the form of a butterfly.

Tuberculosis exists in the world to a much greater degree than the manifestations of consumption would indicate. Many cases end in recovery without attracting attention. Many others end in death from some other disease without the existence of tuberculosis ever being suspected.

Autopsies upon the dead bodies of poor people who have died in charity hospitals from some other disease than tuberculosis reveal the existence of tubercular implantation in vastly the majority. This would seem to indicate that among people in the lower walks of life nearly everybody gets an implantation of tubercle bacilli at one time or another.

Tuberculosis can develop in any part of the body. The tubercle bacillus apparently finds a more congenial culture medium in some tissues than in others, but can grow in any tissue.

The lungs seem to be the seat of predilection. The lymphatic glands and the serous membranes are favorite media. The bones and the organs in the abdomen quite often are the places of beginning. The skin, the mucous membranes, the eye, the ear, and even the brain may be the seat of growth.

There are many chronic diseases well known to the people, which are tuberculosis but travel under aliases. The real character of these diseases is never suspected.

Scrofula nearly always is due to the growth of the tubercle bacillus in lymphatic glands. Lupus is tuberculosis of the skin. White swelling is tuberculosis of the bone. Spine disease is tuberculosis of the vertebræ. Hip disease is tuberculosis of the head

of the thigh bone. Fistula, in many cases, is tuberculosis of the perineum. Water on the brain is tuberculosis of the serous membranes lining the brain. Marasmus, or "take off" as it is sometimes called, is tuberculosis of the lymphatic glands of the mesentery.

Many well-known deformities are the result of tuberculosis which has run its course and gotten well. Nearly all spinal curvatures are due to tuberculosis. The pitiful little hunchback has been made so by tuberculosis. Nearly all stiff joints have been put out of use by tuberculosis. The unsightly scars which frequently are seen on the necks of people mostly are of tubercular origin.

Monstrous as tuberculosis looks when arraigned under all its aliases, its injury to the human family can by no means be measured by its direct ravages. Its indirect damage to mankind is perhaps even greater than its direct.

Our insane asylums, orphan asylums, almshouses, houses of refuge, reformatories, prisons, and penitentiaries shelter the indirect results of tuberculosis; but who can sift these results out from the general debris of sin and disease, and measure them?

CHAPTER VII

How Consumption Came into the World

WHERE did the first case of consumption come from? This question frequently is propounded as a knockdown argument against the micro-organic nature of consumption.

The answer, when asked for this purpose, is, Where did the first man come from? All organic nature came from the same source and was endowed with life by the same power.

Man views with disfavor that which does not serve his selfish ends. It is hard for him to comprehend why micro-organisms which bring him sorrow and distress should spring from the same

source as himself. The irreverant even blaspheme because disease is in the world.

For the preservation of nature as it is, micro-organisms, which have for their function the breaking up of worn-out organic matter into inorganic, are essential. Without them the earth would soon be littered up with organic matter out of which life had gone for one reason or another, and there would not be room enough left to turn around in.

Only for micro-organisms the vegetable kingdom would become extinct for want of food, and all animal creation would die for the same reason. Micro-organisms are links in the chain of metamorphosis between organic and inorganic matter, the severing of which would stop the process.

Disease germs, in all probability, are descended from micro-organisms which in the original design of nature had for their function the transformation of organic into inorganic matter. That by sin

death came into the world may be literally true.

Abuse, excess, and dissipation may have reduced the vitality of the human body to such a degree as to make it easy for micro-organisms, whose function was saprophytic only, to become parasitic. With time and opportunity, through the process of evolution, new kinds of micro-organisms may have sprung up with the order of propensity reversed, becoming primarily parasitic and secondarily saprophytic.

Consumption is a mixed disease. The streptococcus and staphylococcus, which are secondary micro-organisms but essential to the disease, still are saprophytes ordinarily. They become parasites when tissue has been prepared for them. They cannot attack normal tissue. In consumption they depend upon the tubercle bacillus for their standing.

The tubercle bacillus is the primary factor. It starts in business by itself, but it

does only enough damage to make it possible for more destructive micro-organisms to get in.

There are many reasons at hand for believing that the tubercle bacillus is a product of evolution. The chief one is the resemblance of tuberculosis to leprosy.

The micro-organisms which produce tuberculosis and leprosy are well known. They look much alike. The tubercle bacillus also closely resembles many acid fast bacilli which are not productive of disease.

The tubercle bacillus, itself, is modified by the culture medium in which it grows. It is even changed somewhat in its nature by the animal in which it lives its parasitic life.

All acid fast bacilli, disease producing or not, probably have a common ancestry in much the same way as wheat, rye, and barley probably have a common ancestry. They have be-

come distinct independent living organic entities, however, and cannot now reproduce one another or set up any other disease than the one to which they ordinarily give rise. The tubercle bacillus always produces tuberculosis; the leprosy bacillus, leprosy. Each is specific and can reproduce itself only.

Historically it can be established that consumption has existed as we know it for at least three thousand years. Furthermore, we may infer that it had existed for a long while before we read of it in historic writings.

Moses is credited with a knowledge of consumption by commentators of the Bible. His figures of speech in Leviticus, chapter XXVI, verses 13–16, and in Deuteronomy, chapter XXVIII, verses 20–22, probably were inspired by the disease.

Some claim that one of the plagues spoken of by Moses as having afflicted the Egyptians was consumption.

Isaias probably refers to consumption in chapter x, verses 16–23, and Daniel appears to have it in mind in chapter x, verse 17.

Hippocrates in the fifth century before Christ gave a perfect description of consumption and delineated its ravages so well as to make the picture which he drew of it appear like an exaggerated drawing of what we see around about us at the present day. The disease evidently was much more prevalent in his day than it is now.

Galen paints the disease as he saw it among the Romans in the second century after Christ. It was the same disease as with the Greeks. From Galen's day to modern times the story about the disease has changed but little.

The Romans took their knowledge of consumption from the Greeks, and it is quite possible that they got the disease from them likewise. The Greeks are believed to have taken their knowl-

edge of medicine from the Egyptians. It may be that they also got consumption from them.

Back of the Egyptians we can only surmise that the disease may have come from the East out of the dim vista of early civilization. The buried records which now are being unearthed and deciphered may give us new light on the subject.

CHAPTER VIII

Is Consumption Inherited?

THAT which a man seeth he believeth. Consumption in all times has been a family disease. It is so now. Whole families fall victims to it. Father, son, and grandson get it. Uncles and aunts, nephews and nieces, follow each other in perfect order as victims.

Occasionally there is a truce. A whole generation escapes, and then quite suddenly the disease reappears in a new generation and strikes a member who closely resembles a grand-uncle or grand-aunt who has died of it.

Death, moreover, may come to the respective generations at the same time of life.

The father died of the disease at thirty,—the sons died at thirty, and the grandsons die at thirty. What but inheritance can explain these phenomena?

Our knowledge of the biology of the tubercle bacillus makes intelligible to us this strange course of consumption and solves the riddle of heredity. It makes clear to us many things which heretofore could not be understood except upon the theory of heredity.

The cycle of life of the tubercle bacillus may be interrupted without death, either in the body or out of it. It is with it as with wheat or rye or any plant which grows from a seed. If a grain of wheat is kept in a dry place it will maintain its power of germination and growth for years and perhaps centuries. The cycle of life is interrupted, but life is not destroyed.

In the body the tubercle bacillus may lie dormant for a long time. Like grass in a worn-out field, it may grow so poorly as

merely to keep alive. This is apt to occur when implantation has taken place in tissue which has a sparse blood supply, such as lymph-glands. It also may happen when the person in whom implantation has taken place lives a vigorous, healthy life, out of doors, thus making bad soil for the bacillus and completely shutting out the associate micro-organisms.

Then, too, nature, in her effort at cure, may wall in an entire colony of bacilli and shut them off from the healthy tissue by deposits of lime on the outside of the tubercle or little lump which contains them. The cycle of life of the bacillus is interrupted, and the disease lies dormant for years. The bacillus hibernates, so to speak.

At any time during the lifetime of the individual, when more favorable conditions have arisen for the growth of the tubercle bacillus or when the imprisoned bacilli have been set free, perhaps

through the intervention of some other micro-organism, such as the streptococcus and staphylococcus, activity of the disease may be renewed and progress again be made. An implantation which has taken place in infancy may reach full growth of the disease only in middle life or old age.

The cycle of life of the tubercle bacillus also may be interrupted for many years outside of its host. A lump of dried tubercular matter contains millions of living tubercle bacilli. They are like wheat in a granary. So long as they are protected against the elements they retain life, and as soon as they are placed in proper soil they will grow.

In houses in which consumptives live, lumps of dried tubercular matter sometimes lurk in dark corners, where they lie hidden, protected against the elements, for years. Time disintegrates them, and future housewives, the mothers of second generations of the families, may wield the brooms

which distribute the pulverized matter for inhalation.

Consumption therefore is a family disease on account of the life history of the tubercle bacillus rather than of heredity. The disease clings to families for generations because the conditions for implantation and growth of the bacillus and for the completion of its cycle of life exist best in the family, and the bacillus may lie in houses, as wheat in a granary, for generations. Then, too, consumption in a family helps to produce soil for the tubercle bacillus in other members through the hardships, want, and sorrow which it begets.

Sometimes consumption reappears in a family a generation or two after having vanished, because exhausted soil has been replenished. There has been temporary immunity.

The old ideas about heredity of consumption are no longer tenable. They are

at variance with facts which are fully established. Consumption is due to micro-organic life. It cannot be inherited.

The micro-organisms which produce consumption are independent entities, each of which lives through a life history of its own. They must have a beginning and an end, and they can only maintain their kind by reproduction. They need certain soil, certain temperature, and certain environments for growth and development. Even while dormant they must have certain protection against their many enemies.

Consumption cannot be placed in the same category with traits of character, color of hair, and physical form. These qualities are transmitted because they are essential to the organism. The transmission of parasites would be a different matter.

Exceptionally parents may convey tuberculosis to their offspring; but as a disease, and not as a quality of body which may

change into a disease. They even may transmit the tubercle bacillus in a dormant state, embedded in the body of the offspring from the earliest developmental stage, to become active and develop at any time during life. The activity, when it arises, however, is a continuation of a life history which was begun at the time of implantation.

In such cases the disease transmitted does not constitute an inheritance in the old sense. It rather is a contagion.

Transmission of tuberculosis from parent to offspring, even in the limited sense here indicated, is of infrequent occurrence. All the fundamental laws of nature conspire against it.

CHAPTER IX

Predisposition to Consumption

THE discovery of the micro-organisms of consumption has diverted attention from secondary causes, which should not be lost sight of in a crusade against the disease.

These causes are of two kinds, those which arise from within and those which arise from without the individual who gets the disease. The causes which arise from within the individual are expressed by the word predisposition.

Predisposition to consumption is a complex condition which is hard to define. It is one of those things which we all agree exists, because we see it illustrated in everyday life; but we all seem to have the same indefinite ideas about it.

Two people living under the same environments and conditions, enjoying equal health, are exposed to consumption in exactly the same way; one develops the disease and the other does not.

Two families in the same walk of life are subjected to the same kind of hardships and live under equally favorable conditions for implantation of the disease; in one family the disease breaks out, in the other it does not.

A number of white men and a number of colored men of the same physique and average health are exposed to the same danger of getting consumption; for every white man who takes the disease three colored men contract it.

Out of these observations we have formulated the proposition that there is a predisposition to consumption; or, in other words, that some people are more prone to contract the disease than are others.

Predisposition can be classified as indi-

vidual predisposition, family predisposition, and race predisposition.

In every family there is a certain order in which the members will fall victims to the disease. There is a pronest member and a least prone member.

Individual predisposition usually is acquired and may be the result of previous disease, depraved habits, want, hardships, or great sorrow.

Family predisposition is a family matter and goes with entire families or with members of a family who resemble one or the other parent, or one or another ancestor. Families sometimes show such a proneness that they almost become extinct through the disease.

Family predisposition to consumption largely has been responsible for the old ideas about heredity of consumption. Apparently there has been a mix-up of ideas about primary and secondary causes.

Race predisposition to consumption is

perhaps the most noticeable of the three kinds because it is the most striking.

The newer the race in the order of history and civilization, apparently, the more prone it is to consumption.

The American Indian and the negro have a very strong predisposition to the disease. The Gentiles are more predisposed than the Jews.

Among Christian peoples those of Celtic and Teutonic origin seem to have a stronger predisposition than those of Latin and Greek origin.

Science has not yet told us what predisposition is. There are two plausible theories upon the subject, but nothing has been determined definitely.

Some hold that it is an absence of something from the system of a person which, if present, would fight off the disease. Others hold that it is the presence of something in the tissues of a person which con-

stitutes soil for the micro-organisms. There may be truth in both views.

It has been demonstrated that a living organism has within itself powers of self-defense against parasitism and that these powers grow with use.

On the other hand, we know from observations in the vegetable kingdom that plants will not grow unless the earth in which they are planted contains certain ingredients, the presence of which constitutes soil.

Both views in a measure explain the facts as we observe them. Ultimately, no doubt, science will give us exact knowledge upon the subject.

The relative value of predisposition as a factor in the spread of consumption cannot be determined until we have more exact knowledge. At present we can take it only at its face value, which may be much inflated.

The spread of consumption is a com-

plex subject. Personal habits, family practices, and national customs may exercise influences in the spread of the disease which are mistaken for predisposition. The idea of predisposition to disease, however, is in harmony with well-known fundamental laws of nature, and already has much strong scientific backing.

CHAPTER X

Diseases which Predispose to Consumption

CERTAIN diseases become secondary causes of consumption, by depraving the organism, reducing it below the normal standard, and perhaps also by making soil.

It is a fact well known to farmers that certain plants prepare the soil for other plants.

The diseases which predispose to consumption are of two kinds, those which change the contour of the body or of any of its organs, and those which weaken the constitution or modify the tissues of the body. To the former belong rickets, post-nasal adenoid growths, rheumatism, and gonorrhea ; to the latter smallpox, measles, whooping-cough, typhoid fever, syphilis, and pneumonia.

Rickets is a disease of malnutrition, occurring in childhood. It deforms the body. What is known as chicken-breast is due to rickets.

A deformed chest may lessen the capacity of the lungs, and by so doing may interfere with nutrition of the body. It also may interfere with the physiologic action of parts of the lungs and thus cause such parts to be in a state of passive congestion. In either event it prepares the way for consumption.

In the back part of the nose there is glandular tissue, which technically is called adenoid tissue. In childhood this frequently enlarges through colds and malnutrition, and is then called a growth. The enlargement interferes with breathing through the nose, and brings about what is known as mouth-breathing.

A predisposition to consumption is thus created. The enlarged tissue becomes an inviting field for tubercular implantation,

and the mouth-breathing takes away from the organism the protection which nature sets up in the nose against entrance of micro-organisms.

Rheumatism may become a predisposing cause of consumption by injuring the valves of the heart, or by setting up an inflammation and producing a thickening of serous membranes, such as the pleura, the pericardium, and the lining membranes of the joints.

An injured heart often leads to malnutrition of the whole body and to bad circulation of the lungs. Both favor implantation of the tubercle bacillus. Thickened serous membranes are good soil for the tubercle bacillus.

Gonorrhea prepares the way for tuberculosis by injuring the organs which it affects. It sets up an inflammation which changes the tissues and makes of them good soil for the tubercle bacillus. The organs which

usually are damaged by gonorrhea often become the seat of tuberculosis.

Smallpox, measles, whooping-cough, typhoid fever, syphilis, and pneumonia are given credit for making soil for consumption. They frequently are forerunners of it. The going before, however, may be a mere coincidence. Consumption is such a common disease that other diseases, as a matter of chance, often must precede it.

Then, too, mistakes are made. Tuberculosis in the early stages is sometimes taken for whooping-cough; a tubercular inflammation of an upper lobe of the lung, when very acute, often is called pneumonia; and a tubercular inflammation of some of the tissues and organs of the belly may be called typhoid fever.

These cases are tuberculosis from the beginning. Usually the acute symptoms subside and fair health returns; but in due time consumption shows itself. The disease for which the initial symptoms were

mistaken gets the credit of being the cause of the consumption.

All of these diseases may produce soil for consumption by injuring the tissues which they affect.

Some of them probably merely stimulate into activity dormant tuberculosis. The bronchial lymphatic glands which are situated along the air-passages often are the seat of dormant tuberculosis.

Measles, whooping-cough, and smallpox are accompanied by inflammation of the air-passages and sometimes by congestion of the lungs.

This inflammation and congestion stimulate the dormant tuberculosis into an active one, and when the symptoms of the current disease have passed away, the symptoms of tuberculosis remain and gradually attract attention.

Quite naturally the disease which preceded the tuberculosis is given credit for having brought it on.

Whether or not any of the diseases mentioned produce soil for tuberculosis in the sense in which one plant is believed to produce soil for another cannot be determined with the scientific data now at hand. It may be so, but the probabilities are that when tuberculosis follows another disease the succession is a coincidence and not an effect.

As a matter of course all diseases reduce vitality, and temporarily, until the organism has recovered itself fully, pave the way for other diseases.

CHAPTER XI

Dissipation as a Predisposing Cause of Consumption

DISEASE and death are the wages of sin. When the black sheep of a family meets with an early death usually it is by way of consumption.

In olden times this was attributed directly to God's anger coupled with His mercy. Consumption overtook the sinner in order that he might repent.

We no longer attribute disease to an angry, avenging Providence, and yet our most advanced thought cannot divorce disease entirely from sin.

Transgression of the laws of nature is tantamount to transgression of the laws of God and brings in its train a penalty which, even though it come in the natural order

of things, may well be accepted as coming from God.

Dissipation is a scattering of vital forces by an excessive indulgence of any kind. It always strikes at the most vulnerable point, the nervous system. This is true even when the indulgence seems to feed the body rather than to waste it.

Whatever makes for lowered vitality makes for consumption. Lowered vitality means good soil. This is true of lowered vitality, not only as indicated by body-weight, color of skin, and muscular development, but by nerve force.

Degeneracy of the nervous system is the most potent factor in predisposing causes of consumption. Some writers have been led into the error of looking upon it as the primary cause of tuberculosis.

In youth the dissipations which directly or indirectly grow out of the affinities of the sexes become predisposing causes of consumption. Self-abuse, sowing of wild

oats, beau-catching, courting, and all the arts and devices which go with them in these times, make soil for tuberculosis and often lead to it. They all exhaust the nervous system.

Loss of sleep is an important factor in this nerve exhaustion. Especially is this true of the working classes, who often work all day and frolic half the night.

The various kinds of stimulants play a double part in this physical wreck; they injure the nutritive system and they spur on to further abuse when the nervous system complains. Alcoholic beverages, tea, coffee, and tobacco are used to keep up and quiet the nervous system under the strain.

The death-rate from consumption bounds up eight hundred per cent. between the ages of fifteen and twenty-five years, and this, too, during the life period which ought to be the most vigorous and healthy of any.

At this time the great demands on

the system for growth and development are on the wane, the debilitating diseases of childhood are over, the circulation is strong and vigorous,—reaching out into every part of the body, coloring it with beauty and health,—and the ambitions and hopes of life have not yet had the first frost of disappointment. Everything so far as nature itself is concerned makes for health and militates against consumption.

The rapid increase in the disease during this epoch can be accounted for only on the basis of exhaustion of the nervous system through dissipations of youth.

Dissipations of later life, which predispose to consumption, are excess in eating, in drinking, and in the use of tobacco. Most people have the impression that big eating and drinking—a red face and a fat belly — give protection against consumption. This is a great fallacy.

Malnutrition of any kind predisposes to tuberculosis. A florid complexion, the result of dilated blood-vessels, and an excess of fat in the abdomen are signs of degeneration and not of health.

A certain amount of embonpoint, after forty, is natural. It must not be looked upon as a bulwark against tuberculosis, however.

A florid complexion likewise is normal for some people, but when the entire skin is reddened there is a paralysis of the blood-vessels which usually has been caused by food and drink.

Excess in eating and drinking puts a burden on the digestive system and the excretory system which sooner or later incapacitates them. Then begins an interference with normal action in organs of the body, and gradually the organism loses its power of self-protection against invading disease germs.

Excessive use of tobacco may predis-

pose to tuberculosis by weakening the heart. A good vigorous heart-action is of great value in maintaining a normal standard of health, and normal health is the best bulwark against tuberculosis.

CHAPTER XII

Want as a Predisposing Cause of Consumption

CONSUMPTION is largely a disease of the poor. The conditions for implantation are best among the poor and there is good soil for growth and development.

The poor live in small badly ventilated houses on small badly ventilated streets. Frequently they live in what are called blind alleys; that is, streets with only one outlet. Sunshine and fresh air are strangers to such houses.

A house with little sunshine and fresh air easily becomes contaminated with tubercular matter. It serves as a granary for the tubercle bacillus. Everyone who lives in such a house, after contamination, is

liable to get an implantation of the tubercle bacillus.

When consumption gets into a poverty-stricken family every member is doomed to get an implantation. Some recover without the disease being discovered, some struggle a lifetime with the disease under an alias, and the rest die of consumption. Frequently the whole family dies of the disease.

The conditions under which the poor live are conducive to consumption. Old, filthy carpets remain on the floor for years without being cleaned. The paper on the walls hangs in shreds. Window hangings shut out the air and light in exactly the same way day in and day out, year in and year out. The esthetic instinct lies vanquished at the feet of poverty, and disease ravishes the household.

Probably fifty per cent. of the houses of the poor are contaminated with tubercular matter. In many instances the contamina-

tion is intense enough to give implantations for years.

The consumptive poor often move because they cannot pay rent. Every house from which a poor consumptive moves is left contaminated.

Some member of the family moving in is sure to get an implantation. Usually it is the person who occupies the room which had been occupied by the last consumptive.

The personal habits of the poor facilitate implantation of the tubercle bacillus. Use of the kitchen as a dining-room, sitting-room, parlor, and sick-room, eating with unwashed hands, and use of the same eating utensils in common, help the tubercle bacillus, if it is in the household, to get into a new host.

Malnutrition favors implantation of the tubercle bacillus and development of tuberculosis. The poor, as a rule, are badly nourished. They spend their meagre incomes on food which tickles the palate and

starves the body. Often they spend much on stimulants to quiet their complaining nerves.

Ignorance of the nutritive value of food and lack of training in the preparation of food are responsible for this.

Want, in the restricted sense of deprivation of the necessities of life, prepares the way for consumption by taking from the individual his resisting power to disease. It not only invites implantation but favors growth and development. It makes rich soil in which growth is luxurious and crops mature rapidly.

Starvation is so like tuberculosis in its effect as to be indistinguishable from it upon casual observation. Both emaciate the body to an extreme degree.

In practical life there is great affinity between starvation and tuberculosis. They pass through the world in their work of devastation linked arm in arm when possible, and when separated strive to come

together by preparing the way for each other. In viewing the ruins it is hard to say how much was done by the one and how much by the other.

Insufficient clothing reduces the resisting power of the body to disease by diverting an excessive amount of vital force to heat-making purposes. Food is largely used up for heat, leaving very little for other demands of the organism.

In olden times it was believed that insufficient clothing was the real cause of consumption. This led to the practice of "bundling up" and "housing closely" on the part of those who could afford it, and gave rise to a new predisposing cause of consumption.

Insufficient shelter only becomes a predisposing cause of consumption inasmuch as it makes people shut themselves up in close rooms to keep themselves warm. Outdoor life gives protection against tuberculosis no matter how cold the weather may be.

CHAPTER XIII

Overwork as a Predisposing Cause of Consumption

WHEN the living body is in a perfect state of health and all its machinery is running at a normal rate of speed, it has great power of destroying disease germs by its own fluids. This power is called phagocytosis.

Phagocytism exists in the blood. Exactly what constitutes it we do not know. The literal meaning of the word is "eating a cell."

The blood is a composite substance containing many important elements. One of these, the white corpuscle, displays a propensity for eating cells, and is credited with the power of destroying disease germs.

The probabilities are that phagocytism

depends upon more than one element of the blood. In practical life it is best where the blood is most perfect.

Blood-making is a very complex process. Almost every organ of the body enters into it. Practically all the internal secretions of the body are poured into the blood. Excessive use of one organ or department of the body therefore may interfere readily with blood-making.

A common cause of disturbance of phagocytism is fatigue. Overwork probably interferes with the blood-making process by diverting too much energy from the organs concerned in it. Every individual has his limitations in the production of energy.

When a person uses more than the normal proportion of energy for one purpose, functions which cannot be suspended may be imperfectly performed on account of deprivation. Blood-making is a constant function, which cannot be stopped without prejudice.

Probably all diseases are more readily contracted after fatigue than at any other time. Some show a marked propensity this way. Pneumonia is almost always contracted after fatigue.

Colds usually first manifest themselves after fatigue. A person gets very tired and sits down to rest. By and by he feels chilly and stuffed. He looks around and sees an open window or door, or finds himself in the open. He concludes that he has taken cold from sitting in a draught or from exposure. In reality the disease existed before the fatigue, but in an undeveloped state and was fanned into activity by it.

Consumption is much influenced by fatigue, but not in a way easily discerned. Cause and effect follow each other so far apart in consumption and in such a crowd of influences that their relationship is not manifest.

The human body ordinarily cannot make enough energy to supply the demands of

occupation and disease at the same time. In tuberculosis, however, it can make enough to keep the disease at bay for a long time during occupation and sometimes to fight it to a finish. There is a strong tendency toward recovery in tuberculosis.

Implantation of the tubercle bacillus is facilitated by fatigue. This explains why of two persons apparently with the same propensities and under the same environments, one takes the disease and the other does not.

In the development of tuberculosis fatigue is a potent factor. When people are sick with acute diseases, they go to bed in order to give their bodies every chance of throwing off the disease. When they have tuberculosis, they work as usual.

Overwork usually helps to mature the earlier implantations of the tubercle bacillus. A person has a very small crop of tubercle bacilli growing in the apex of one lung. It attracts no attention. He fatigues

himself unduly and has a slight breakdown for a week or two.

The breakdown is called a cold by the patient and his friends and perhaps by his doctor. In reality it is the harvest of one crop of tubercle bacilli and the seed-scattering of another and larger one. Overwork was the sunshine which ripened the crop.

As tuberculosis grows and develops into consumption fatigue becomes a powerful factor in the work of destruction. It is the night shift, so to speak. It makes the onslaught upon the vitality of the individual continuous. What the disease does not accomplish fatigue does.

Overwork is largely responsible for the high death-rate from consumption. The poor work until they drop in their tracks. The part played by fatigue does not appear in the mortality statistics, however.

CHAPTER XIV

Alcohol as a Predisposing Cause of Consumption

THERE is a popular idea that alcohol is a preventive of consumption. In America and England whiskey is the beverage credited with such powers, in France wine, and in Germany beer.

It would be interesting to know how this idea originated. Usually popular ideas, even when false, contain a germ of truth.

A moderate use of alcohol stimulates nutrition. It gives a ruddy complexion and a round form. These stand out in strong contrast with the pale face and emaciated form of the consumptive.

The popular mind jumps at conclusions. It sees the ruddy round form and it sees

the pale emaciated form. Because it associates the one with the use of alcohol, it associates the other with the want of it.

Theoretically, it may be true that alcohol prevents consumption. Healthy nutrition prevents consumption, and within certain limits alcohol stimulates nutrition. Herein no doubt lies the germ of truth.

The amount of alcohol which can be taken within limits of stimulation of nutrition is exceedingly small, however. In practical life it seldom is adhered to.

When a larger amount of alcohol is taken than can be appropriated advantageously by the system, it becomes an irritant and a check upon nutrition. Malnutrition may exist even with a ruddy face and a round form.

Few limit themselves to the amount of alcohol which can be taken within bounds of good health. One readily acquires a habit of taking a beverage and soon cultivates an appetite for it. Habit and appetite lead to excess.

When people drink alcoholic beverages they do so to quench thirst, to satisfy a craving, or for the sake of good fellowship. In any event they do not regulate the beverage by the alcohol but by the incentive. Usually they get enough alcohol to poison themselves.

Alcohol in poisonous doses gradually brings about changes in the liver and kidneys. These organs apparently become martyrs to duty. They try to protect the system against the evil influence of the alcohol and wear out in so doing.

Excessive labor of the liver and kidneys throws an undue burden upon the heart and blood-vessels, which ultimately leads to injury. Finally, when the pump and pipe lines have been damaged, the whole organism is at a disadvantage in fighting disease.

At first the heart muscles enlarge, then degenerate and stretch. The blood-vessels thicken. With obstruction in front and weakness behind the whole body becomes

water-logged with blood. The lungs suffer even more than the rest of the body because of the double circulation which passes through them.

Slow stagnant circulation is conducive to implantation and growth of the tubercle bacillus. An organ which has been injured by violence or disease is prone, on this account, to tuberculosis. For the same reason tuberculosis usually begins in the upper part of the lungs.

When a family is exposed to tuberculosis the members who use alcohol to excess are among the first to contract the disease. Bar-tenders frequently are victims of tuberculosis.

Among the poor alcoholism and tuberculosis are seen hand in hand as boon companions in their work of destruction. In France alcoholism is looked upon as the most potent factor in the spread of tuberculosis.

The coincidence of alcoholism and tuber-

culosis does not necessarily prove that alcohol is a predisposing cause of consumption, but it does prove that it is not a preventive. It may be that the filthy habits and bad environments which go with alcoholism lead to implantation of the tubercle bacillus. The fact remains, however, that an alcoholic is more likely to get tuberculosis than a nonalcoholic.

Alcoholism in the parent appears to produce a predisposition to tuberculosis in the offspring. This is in line with a general principle, however, which does not apply to tuberculosis alone. Alcoholism in the parent leads to degeneracy in the offspring. Degeneracy paves the way for all kinds of diseases.

Alcoholism helps tuberculosis in its work of destruction. An alcoholic with tuberculosis is more difficult to treat than a nonalcoholic. Unless he stops the alcohol there is no hope for him.

CHAPTER XV

Climate as a factor in Consumption

HIPPOCRATES, five hundred years before Christ, taught that consumption was a weather disease. Wet seasons, damp winds, and sudden changes in temperature were blamed. Hippocrates reflected the views of the ages before him.

The world still believes much of what Hippocrates taught. With most people climate is the chief factor in consumption. "Oh, this beastly climate!" is on the lips of the consumptive and his friends wherever you go.

In cold climates it is the low temperature which specifically is blamed, in damp climates it is the moisture, in high dry climates it is the dusty winds and great variation of temperature between night and day, and in warm climates it is the terrible heat.

There is no place in the world which has withstood the inroads of consumption. Countries which were free when first visited by civilization soon developed a fine crop after the disease had been introduced.

Of the newer countries many are known to have been free from consumption when discovered. The Bermudas, America, and the Sandwich Islands were strangers to it until visited by civilization.

The Bermudas have an even climate. Consumption came with the Europeans, soon became rampant and wiped out the natives.

New York at one time was a health resort for consumptives; so was Pennsylvania and so was every State in the Union in turn and in order going west. The reputation earned in the primeval forest was lost in the cultivated fields. When consumption became prevalent, it was said that the climates had changed.

The American Indian had been free from

consumption up until the time when he met the European consumptive. Contact was fatal to him. He developed consumption in the most malignant form and was exterminated.

The Hawaiians were free from consumption when first visited by missionaries. They had colds and coughs but no consumption. Their delightful climate attracted the consumptive. Now they are decimated by the disease.

The United States census report of 1900 shows the highest mortality from consumption to exist in the finest climates. California, Arizona, Oregon, Nevada, Colorado, South Dakota, Kentucky, Tennessee, Virginia, North Carolina, and South Carolina are the banner States of the disease. As a matter of course, many of the deaths in these States are of health-seekers.

In analyzing the influence of climate upon consumption it is necessary to keep in mind the complex nature of consumption.

The tubercle bacillus, the streptococcus, and the staphylococcus each has an individuality, and all of them are influenced more or less by such micro-organisms as the pneumococcus, the influenza bacillus, and the cold micro-organisms.

On account of the relationship between the tubercle bacillus and other micro-organisms the prevalency of consumption in a place depends somewhat upon the prevalency of other diseases. In consequence of this in some climates tuberculosis may not develop into consumption as readily as in others.

The tubercle bacillus can be implanted in any climate known to man. Apparently also it grows and forms tuberculosis in any climate.

Some climates, however, seem to be less favorable than others for the implantation and growth of the streptococcus and staphylococcus. Tuberculosis, therefore, is less prone to change into consumption in such

climates, and accordingly there is a greater tendency toward recovery.

In mild climates in which there is a great deal of sunshine the tubercle bacillus also has less chance of entering a new host after leaving its old host than in cold climates with little sunshine. Outdoor life and sunshine are enemies of the tubercle bacillus. There is less contagion therefore.

Strictly speaking climate has no causative relationship to consumption. It influences the disease only in so far as it affects the micro-organisms which have to do with the disease.

In a general way cold dry climates are less conducive to the prosperity of the micro-organisms which have to do with consumption than are moist warm climates. Consumption usually runs a more rapid course in warm climates than in cold climates.

CHAPTER XVI

Immunity from Tuberculosis

THERE is an inherent law of antagonism in organic nature by which the existing state of things is preserved. Every living thing is in a sense parasitic and in turn is preyed upon. In the interest of equilibrium all life has been endowed with a sense of self-preservation and powers of self-protection.

Man is the prey of many kinds of parasites. He has, however, within himself ample resources of warfare against destruction by them.

When the human system has waged war against a parasite and has won the battle, a condition usually arises under which the

same parasite cannot again take up arms against it for a longer or shorter period of time. This is called immunity.

How immunity is brought about we do not know. Some claim that it is by a high development of phagocytosis or disease-fighting power. Others that it is by an exhaustion of soil upon which the parasite feeds.

In a way immunity is the antithesis of predisposition. It is the negative pole of an organism toward disease where predisposition is the positive pole.

Immunity varies in quantity and quality. It may be so full and complete as to give absolute protection under the most intense exposure, and it may shade down from this to such a small quantity as to merely modify the disease instead of protecting against it. Incomplete immunity is illustrated in varioloid.

The quality of immunity is shown by its endurance. Immunity is perfect when it is

absolute for life. It shades from this to mere partial protection for a comparatively short period of time. The immunity which sometimes is conferred by smallpox is an illustration of perfect immunity.

Immunity may be acquired by an individual, by a family, and by a race. Individual immunity always is obtained through a personal struggle against a disease. It is the only form of immunity which ever is perfect and complete.

Family immunity is the result of the prolonged struggle of a family against a disease for several generations. As a rule it is imperfect and incomplete, but at times it is absolute. It can be transmitted from parent to offspring.

Racial immunity is the aggregation of family immunity of an entire people. It always is incomplete. It modifies a disease but does not give protection against it.

Acute diseases, which affect the entire body at once, give the best and most

complete immunity. Smallpox, measles, scarlet fever, and typhoid fever are good examples of diseases which give complete immunity. Acute diseases, however, apparently do not produce family and racial immunity in the same degree as do chronic diseases.

Chronic diseases, which affect only a part of the body at one time, and which gradually extend their devastation until finally they have damaged the entire organism, usually kill before they can produce perfect immunity. Consumption and cancer are examples of such diseases. Chronic diseases have a stronger tendency to produce family and racial immunity than have acute diseases.

Tuberculosis seldom gives rise to complete perfect individual immunity. It may produce an immunity strong enough, however, to protect against subsequent attacks under ordinary exposure. Persons who have recovered from tuberculosis appear to

be less susceptible to the disease than persons who have not had it.

Family immunity against tuberculosis is of common occurrence. It is produced by a prolonged struggle against the disease through several generations.

Parents who have had tuberculosis and have recovered from it or who have tuberculosis at the time of procreation apparently transmit a partial immunity to their offspring. If the offspring gets tuberculosis, it will be in milder form than the parents had it.

Such offspring if it has had tuberculosis and has recovered from it or if it is tubercular before or at the time of procreation may in turn transmit a better immunity than did its parents. Ultimately by a continuance of the process immunity becomes complete and perfect.

Family immunity against tuberculosis when once acquired may be transmitted to offspring, but is not permanent. It may

last for several generations, however. Its instability gave tuberculosis the classical reputation of skipping a generation or two occasionally in a family and then re-appearing.

Racial immunity from tuberculosis is found among many peoples, and can be demonstrated by the aid of history. The Jews have the best immunity. Among the Gentiles, the Greeks, the Latins, the Teutons, and the Celts follow each other in respective order.

The Jews, of all people known, are least prone to tuberculosis and recover most readily when they have it. They probably have been exposed to the disease longest of any people known. They have fought the disease longest and have developed most resisting power. Their immunity, however, is neither perfect nor complete.

As compared with newer races the Europeans show some immunity from tuberculosis. The Spaniards, Italians, and

French have the best, and the English, German, and Irish follow in the order named.

The races which have been exposed to tuberculosis for a comparatively brief period of time have very little resisting power to the disease. The American Indian was wiped out before he could develop an immunity. The American colored man is three times more susceptible to the disease than his white brother.

In the interior of Africa tuberculosis is said to be still unknown. The African when he comes to countries in which tuberculosis exists, however, shows a very great susceptibility to the disease, and gets it in malignant form. As compared with him the American negro has developed some immunity in the time during which he has struggled against the disease.

In the concrete, immunity from tuberculosis is hard to demonstrate, because of the universality of the disease and the many

influences which enter into its development. It can only be recognized when the disease is studied in a broad historical way.

In the abstract, however, immunity from tuberculosis is easily proven. The existence of the human race proves it. Tuberculosis is universal and it is contagious. It has existed for ages. There must have been a saving power somewhere or the whole human race would have been wiped out before now. Immunity has saved the human race.

CHAPTER XVII

Tuberculosis is Contagious

ALL diseases which are due to a living organism are communicable. They cannot arise except by communication.

Micro-organisms are living things. No living thing can come into existence except through a living thing of its kind. Life begets life.

Communicable diseases are subdivided into contagious and infectious. This subdivision tells something of the life history of the micro-organisms and hints at the proper methods of prevention.

Micro-organisms which ordinarily do not multiply outside of a host must go directly from one host to another. Diseases pro-

duced by such micro-organisms are called contagious.

Micro-organisms which multiply outside of a host or which have two kinds of hosts for different periods of their existence may go from one host to another in a very roundabout way. Diseases produced by such micro-organisms are called infectious.

The word contagious is derived from a Latin word, "contingere"—to be in contact with. The word infectious is derived from the Latin words "in" and "facere" to put in or make in.

With contagious diseases there must be contact between the person giving off the disease and the person getting it. This contact may be direct or indirect.

It is direct when the person getting the disease is in contact with the person giving it off. It is indirect when the person getting the disease is in contact with a place or thing which has been in contact with the person giving it off.

With contagious diseases the force required for conveying micro-organisms from one to another must be generated by the two persons concerned. One ejects them and the other inhales them or carries them into his stomach with his food. The two persons must be close together.

With infectious diseases the contact between the person giving off the micro-organisms and the person getting them is unnecessary. They may be many miles apart.

The force required for conveying micro-organisms from one to another with infectious diseases is generated in part at least, and in some instances entirely, outside of the two persons concerned. It may be a force in nature such as water or it may be generated by some other living thing, such as a mosquito, which acts as an intermediary host.

Smallpox, measles, and scarlet fever usually are given as types of contagious dis-

eases. Yellow fever, malaria, and typhoid fever are looked upon as types of infectious diseases.

With smallpox, measles, and scarlet fever the micro-organisms are given off by the skin, and probably by the secretory and excretory organs. In order to get the micro-organisms which produce these diseases one must go to the place where they are given off, or have something brought to him from the place.

With yellow fever and malaria the micro-organisms are not given off at all. They are taken out of one host, carried to another and put into him by a mosquito.

With typhoid fever the micro-organism is carried from one host to another by water. Typhoid fever is not a typically infectious disease. It partakes somewhat of the nature of a contagious disease.

Tuberculosis is typically a contagious disease. It is always and only a contact

disease. It cannot be conveyed except by contact.

The tubercle bacillus ordinarily does not multiply outside of a host. Its cycle of life is in suspense from the time it leaves one host until it enters another.

It has no powers of locomotion. It is not conveyed from one person to another by water nor by an intermediary host.

It lies on the spot where it lodges when ejected from an old host until some extraneous force moves it. The forces in nature which can move it, such as air and water, are destructive of its life.

The only way in which it can be moved without prejudice is by being carried on something on which it lodged, when expectorated. This is often done and constitutes one form of indirect contact. Such things are called fomites.

Ordinarily the new host must come to the place where it is ejected. When this happens during the lifetime of the old host

it constitutes direct contact. When it happens after the death of the old host it is another form of indirect contact.

Contact with the person who has consumption, contact with the place which has been occupied by a consumptive, and contact with a thing which has been used by a consumptive are the three methods by which tuberculosis is contracted. The first probably gives two-thirds of all implantations, the second two-thirds of the remaining third and the last the balance.

For implantation of the tubercle bacillus contact with a person, place, or thing capable of conveying the disease must be intimate and prolonged. Casual contact proves sterile.

The contagiousness of tuberculosis differs from the contagiousness of such diseases as smallpox, measles, and scarlet fever in rapidity of action and in intensity. In everything else it is the same. In smallpox, measles, and scarlet fever contagion is

given off by the entire body. Places and things are therefore quickly contaminated. In tuberculosis contagion usually is given off by one part of the body only. Contamination therefore is slow.

Momentary contact with a person suffering from smallpox, measles, or scarlet fever or with a place or thing which has been in contact with such a person may convey the disease. It requires prolonged contact to convey tuberculosis.

Smallpox, measles, and scarlet fever are contagious from the time they begin until the injured skin has completely peeled off and become natural again. Tuberculosis is not contagious before there is spitting up or formation of matter and may be non-contagious at any time during the disease when there is no spitting up nor pus-formation.

With smallpox, measles, and scarlet fever it is impossible to collect and sterilize all the matter which contains the micro-organisms.

With tuberculosis every particle of matter which contains micro-organisms can be controlled and sterilized.

With smallpox, measles, and scarlet fever it is impracticable to make the persons suffering from the disease innocuous to others without isolation. With tuberculosis the patient can be made harmless to others even under the most intimate family relations.

CHAPTER XVIII

How Tuberculosis is Spread by Contact with the Consumptive

FOR the production of tuberculosis there must be a seed, a sowing, a growth, a ripening, and a harvest. The seed is the beginning and end of the cycle of life of the bacillus.

The chief source of seed supply is the consumptive. He represents the end period of the cycle of life,—the harvest field so to speak of tuberculosis.

Tuberculosis really is not contagious until the tubercular subject becomes a consumptive. There must be softening of the tubercles and emptying out of the softened matter before there can be contagion.

It is not necessary, however, for the consumption to be advanced. A very small nodule may soften and come away—so small as to give no symptoms.

A tubercular subject becomes consumptive when he begins to spit up tubercular matter. From this time his disease begins to be contagious.

The contagiousness of tuberculosis depends entirely upon the broken-down matter. In tuberculosis of the lungs it is the spit. In tuberculosis of other parts it is the matter or pus.

There is no contagion in the breath of a consumptive. During the acts of coughing and sneezing, however, a spray of tubercular matter may be thrown out of the mouth and nose.

The form of tuberculosis which most frequently is the source of contagion is tuberculosis of the lungs. In this form, after softening has taken place, broken-down matter may be given off constantly

in small quantities. It is only after cavity formation, however, that contagion is likely to be continuous.

In tuberculosis of other internal organs the broken-down matter, if given off at all, comes away in large amounts, usually at one time, through the formation of an abscess. Under such circumstances there is little chance of contagion because the broken-down matter is disposed of at once.

In tuberculosis of the skin and external lymphatic glands there is considerable opportunity for contagion on account of the constancy of the discharge. The danger is much less than with tuberculosis of the lungs, however, as the amount of broken-down tissue is less.

A consumptive is a center of contagion. The contagion is greatest in his person and diminishes in proportion to the distance away from his person.

The intensity of contagion increases in ratio to the progress of the disease toward

a fatal issue. The deathbed period of consumption probably is the most prolific time of new implantations.

The contagion does not extend very far away from the person of the consumptive. Even in the room in which he lies it diminishes in ratio to the distance away from the head of his bed.

The contagiousness of tuberculosis depends much upon the habits of the consumptive. If he is careful about where he spits and is cleanly about himself, keeping his hands and face clean and his clothing free from blemish, he practically is harmless. In proportion as he is careless and uncleanly he becomes dangerous.

The handkerchief is a prolific agent of distribution of tubercular matter. The matter which is deposited in the handkerchief soils the hands, the lips, and the pocket in which the handkerchief is carried. The handkerchief gives off moisture

quickly and then the dried tubercular matter is scattered broadcast through shaking of the handkerchief when in use.

The use of rags and bits of lint is equally as dangerous as the use of handkerchiefs for the same reasons. People think themselves secure in the use of such articles because they afterward burn them instead of washing them. The danger is in the use, however, rather than in the washing.

The hands get soiled through handling handkerchiefs and rags and such things or through wiping the mouth with the hand or through stroking the mustache and whiskers. By handshaking the tubercular matter then is distributed to others who in turn carry it into their stomachs with their food.

In spitting the lips get soiled and in using a handkerchief the mouth and face get smeared with matter. Kissing upon the mouth under the circumstances

or even upon the face conveys the tubercular matter to the lips of the person kissing.

The clothing of consumptives who are still walking about frequently becomes contaminated through coughing and spitting, especially when they try to spit away from themselves. This is true in particular with men who wear beards and mustaches.

Agitation of the clothing which has been contaminated in this way raises a fine dust laden with tubercular matter. The distance around about a consumptive in which this dust can give an implantation is quite restricted, however.

The bed-linen and bed-clothes of consumptives who are confined to bed easily get soiled with tubercular matter. This happens partly through efforts to spit into vessels at a distance and partly through placing soiled handkerchiefs or rags under the pillow.

Contamination of bed-clothes leads to contamination of the furniture and walls of the room. The tubercular matter on the bed clothes dries and becomes pulverized and agitation distributes it throughout the room.

Contaminated bed linens and handkerchiefs also are a source of danger to the laundress. Handling of the linens before washing raises a fine dust which contains tubercular matter, thus placing the laundress in a contaminated atmosphere. She also is in some danger of contaminating her hands, and through her hands her food.

CHAPTER XIX

Consumption is a House Disease

WELL may consumption be called a house disease. Its beginning and end usually are in the house. The seed is picked up in the house and the patient finally succumbs to the disease in the house.

The tubercle bacillus in every sense is a house plant. It finds its most favorable conditions for preservation, implantation, growth, and association with other micro-organisms in the house.

Vital tubercular matter accumulates in a house because it is not easily devitalized. As time goes on the number of living bacilli in the house increases to such a degree as to make it possible for a large enough number to get into the system at one time to overcome resisting power.

Houses which are occupied by consumptives not only are breeding-grounds for consumption during the lifetime of the person afflicted, but for a long time after his death. As a rule they have a long list of deaths to their credit.

Houses of this kind have been tabulated for statistical purposes. It has been shown that they have deaths from consumption every year or two.

A happy family moves into such a house in good health, unconscious of what is in store for them. By and by a member who occupies a certain room, perhaps the best, begins to fail in health. Inquiry discloses that a former occupant of that room had died of consumption.

When the deaths from consumption in a given district are tabulated for a period of twenty-five years, it is found that they have occurred in only about one-fourth of the houses of the district. Side by side with the contaminated houses stand houses

which have remained free from the disease.

This predilection of the disease for certain houses even holds good in the slum districts. On the worst streets only two-thirds of the houses are visited by the disease during that time.

This recurrence of the disease in certain houses and non-occurrence in others, standing side by side with them, shows how much the tubercle bacillus depends upon the house for implantation. It shows how much consumption is a house disease.

The house is well constituted as a breeding-ground for consumption. Tubercular matter which gets upon the walls, furniture, carpet, and hangings, in the form of dust, retains its viability for a long time on account of the absence of sunlight and the stagnation of the air.

Houses as built and furnished give the very best conditions for implantation and growth of the tubercle bacillus. In this

regard civilization has been a conspiracy against human happiness.

Civilization has been blamed for bringing consumption into the world. In a way the blame is well laid. Civilization has brought us houses, and houses have much to do with the spread of tuberculosis.

In pursuit of happiness man needed privacy and protection. He accordingly built his castle to shut himself in and to shut his enemies out. With his enemies he has shut out his friends, the sun and fresh air.

Man needs sunlight and fresh air for prosperity. The tubercle bacillus needs darkness and stagnant air. Houses are built and furnished to shut out the sun and air as much as possible.

In cities, moreover, houses are built too close together for the sun and air to get at them and through them. Streets are narrow, and where the poor live often have but one outlet.

Streets with one outlet have a higher

death-rate from consumption than have streets which are cut through. Houses which stand back to back have a higher death-rate than have houses which run from street to street.

Houses which are built on damp, non-porous soil have a higher death-rate than have houses which are built on a dry, well-drained soil. These facts at one time led to the belief that dampness was a cause of consumption.

Houses not only favor the bacillus by preserving its life and helping it to get into a new host, but prepare its victim by reducing his vitality. Fresh air and sunlight are requisite for healthy nutrition.

The development of tuberculosis into consumption and the progress of consumption to a fatal issue are facilitated by indoor life. With ample sunlight and fresh air the human organism would have a better chance to successfully struggle against the tubercle bacillus and its associates.

CHAPTER XX

The Workshop in the Spread of Tuberculosis

THE dwelling-place of the consumptive is the richest granary of the tubercle bacillus known. It is made so because the consumptive spends most of his time in it during the contagious period of the disease. The last few months of life are almost entirely spent in the dwelling.

On account of the long duration of consumption, however, other places than the dwelling likewise become rich granaries of the bacillus. The foremost among these is the workshop or factory.

It would be difficult to estimate the average length of time which the consumptive devotes to his business before giving up.

It is undoubtedly much longer than generally is supposed. With some it is nearly a lifetime.

It is true consumption is not contagious during the entire working period. Often there are intervals of months and even years during which no broken-down tissue is given off.

In every case, however, there are months at a time, following a cold or an attack of softening, during which the patient works and gives off contagion. After cavity formation contagion usually is continuous.

The workshop does not gather up tubercular matter as rapidly as the dwelling, because the consumptive spends less time in it, and whilst in it is less productive of tubercular matter. In the end, however, it becomes as much contaminated on account of uncleanliness.

There is less restraint in the workshop than in the home. As a rule, the workman spits where convenient in his place of em-

ployment. The dirtier the place, the more careless he is about where he spits.

The dirt and tubercular matter dry out and are ground up into fine dust. This is always suspended in the atmosphere while there is activity in the shop, and is deposited upon everything in the shop when work is interrupted.

Fellow-workmen inhale the tubercle-laden dust with every breath and carry it into their stomachs with their food while eating their luncheons.

The conditions for implantation of the tubercle bacillus are nearly as good in the workshop as they are in the home. The only difference is that the exposure to contagion is not quite as continuous nor is the contagion quite as intense.

In the workshop exposure usually is for eight hours only out of the twenty-four; in the home it is for sixteen and sometimes for the entire twenty-four. The time during which the greatest amount of expec-

toration takes place, moreover, is the morning and the evening, and this usually is spent in the home.

Implantation of the tubercle bacillus in the workshop is facilitated very much by bad ventilation. Workshops are built for the business and not for the employees. The health of the employees rarely is thought of in the construction.

The amount of cubic air-space to the individual requisite for health while indoors is not considered and no provision is made for efficient ventilation. Erroneous ideas about taking cold from open windows makes the employee shut off the only source of ventilation at his command.

In some kinds of business, moreover, open windows are not permitted because they would interfere with good work. This applies especially to some kinds of painting, to varnishing, and to cigar-making.

Rebreathed air is poisonous and interferes with nutrition. It therefore makes

good soil for the tubercle bacillus and its associates. It moreover works along the same line of destruction.

Workshops into which tuberculosis once has been introduced have their victims continuously at regular intervals. As one case ends, another begins. Usually they get a long list of deaths marked up against them.

Workshops in which the occupation sets up a very irritating dust, such as steel filings or pulverized stone, usually have a very high death-rate from consumption. The irritation set up in the delicate mucous membrane prepares the way for the admission of the tubercle bacillus into the bronchial lymphatic glands.

CHAPTER XXI

The Store in the Spread of Tuberculosis

WHEREVER a consumptive is during the contagious period of his disease there is an environment of contagion. The capacity of this environment for implantation, however, depends upon the habits of the consumptive, the length of time of contact, and the sanitary management of the place.

If the habits of the consumptive are in strict accord with the teachings of preventive medicine, the environment remains sterile, no difference what the length of time of contact or the sanitary management of the place may be. In proportion as these habits deviate from the teachings of science, length of time of contact and sanitary management become controlling factors.

How much time a consumptive with in-

correct habits must spend in a place to create an environment competent to implant the tubercle bacillus cannot be determined with exactness. Other factors, such as the amount of tubercular matter given off, the susceptibility of those exposed, and the sanitary condition of the environment, enter into the problem.

It may be said, however, with a fair degree of positiveness that it must be a considerable time. Momentary stay in a place, no difference what the habits or the sanitary condition, will not produce such an environment.

Neither can it be determined with accuracy what part the sanitary condition plays in the establishment of a fertile environment. In a general way it may be said, however, that good sanitation proportionately neutralizes incorrect habits and lengthens the time of contact necessary for implantation.

These modifying factors of contagious

environment must be kept in mind when studying stores in the spread of consumption. In stores we not only have the fellow-employee to consider, but also the purchaser.

In nearly all large stores there are consumptives in all stages of the disease, from a mere implantation to the large cavity at which the disease constantly is contagious. Most of these are in a noncontagious stage of the disease.

Stores prepare people for invasion of the tubercle bacillus. Ventilation is bad and the air constantly is rebreathed. The employees, as a rule, are badly nourished and are in a receptive condition.

Stores, however, fortunately are not very good granaries for the tubercle bacillus. They are large and have to be kept clean. The constant presence of many people to some extent enforces habits of cleanliness and refined manners.

The spread of tuberculosis in stores chiefly is from employee to employee. The persons most exposed are those who work side by side with the consumptive.

Fertile environment probably does not extend beyond the counter of the consumptive. Even this lessens in proportion to the distance away from the place where the consumptive stands.

Purchasers probably do not run any risk while making the purchase. However intense the contagion, exposure is too short to give an implantation. Tuberculosis requires a long intimate exposure for implantation.

The real danger to the purchaser lies in the things which he carries home with him or which are sent into his house. An unclean consumptive contaminates everything which he handles. Goods handled by such a consumptive may be smeared with a good deal of tubercular matter.

Even from the things sent home, how-

ever, the danger is not great, unless perhaps with food which is eaten in the raw state. Other things would not be apt to convey enough bacilli to give an implantation except to people of a very strong predisposition.

The kind of stores from which there is most danger to the purchaser are candy-stores, fruit-stores, and grocery-stores. Even from these, however, there is practically no danger unless purchases are made daily for a considerable period of time.

The number of tubercle bacilli which one can get ordinarily from once eating contaminated candy, fruit, or raw food of any kind will not give an implantation unless there is extraordinarily good soil. The disease-fighting power of the body has to be overcome before an implantation can take place.

CHAPTER XXII

The Office in the Spread of Tuberculosis

THE sedentary life of the clerk always has been looked upon as a prolific cause of consumption. Out of this association of ideas grew the popular belief that inactivity has much to do with the production of consumption.

Like the popular idea about the causal relation between cold and consumption, this notion about inactivity often has been an impediment to recovery. Looking back from effect to cause for a remedy, people have sought health but found death in overactivity.

Popular reasoning was something like this: An inactive life means disuse of the lungs, disuse of the lungs leads to decay, and decay is consumption. Bending over

the desk, with what was believed to be consequent round shoulders, likewise was given some blame.

Contagion, the real cause, never was suspected. We now know, however, that the reason why clerks frequently are victims of consumption is because the offices which they occupy are environments of contagion.

Offices are peculiarly well adapted for contagious environment of tuberculosis. They rarely have enough cubic air-space for the number of people employed in them.

As a rule, clerks object to having windows open. Inactivity slows down their circulation and makes them sensitive to cold. Cross-ventilation, moreover, may disturb papers and books.

The consumptive clerk above all objects to having the windows open. He thinks he caught his cough from an open window, and he anxiously guards himself against fresh colds.

Offices usually are furnished with spittoons at short distances one from another. It is customary for the clerks to spit into the spittoons from where they stand or sit. Frequently the spitter misses his aim and hits the outside of the spittoon or spits on the floor.

A consumptive who spits into a spittoon creates a contagious environment in two ways. He sprays tubercular matter over his clothing and into the air around him and puts tubercular matter where it will dry and be scattered about. A considerable area about the spittoon becomes covered with dried tubercular matter.

Every time such a consumptive agitates his clothing he throws into the atmosphere tubercle-laden dust. In the evening the broom of the office-cleaner stirs up the dried matter on the floor and sets it afloat.

Overnight the tubercle-laden dust settles on the walls, the furniture, and the books. Hustle and bustle in the office on the fol-

lowing day again sets it afloat, and reinforcement of tubercular matter comes from the same source as came the matter on the day before. In time a contagious environment is thus created capable of giving implantations.

In the office as in the workshop and store the greatest danger is to the clerk who is next to the consumptive. The contagious environment is circumscribed and does not extend far from the person who creates it.

Persons somewhat removed from the consumptive, unless very much predisposed to the disease, are not apt to take in a large enough number of bacilli at one time to produce an implantation. Even in inoculation experiments there is a minimal dose for fertility.

An office which has acquired a fertile environment of contagion can give an implantation to occupants even after the contaminating person has left it. The place occupied by the consumptive and the furni-

ture and books used by him are the greatest source of danger.

Offices which once have become contaminated usually have a number of victims to their credit before they again become sterile. Such offices may have from three to five consecutive deaths in close succession.

Large offices in which many clerks are employed usually at all times have tubercular subjects in all stages of the disease. Some are just beginning, some are near their end, and some maintain an even condition of health in spite of the tubercular process for a lifetime.

CHAPTER XXIII

Hotels and Boarding-houses in the Spread of Tuberculosis

CONSUMPTION is a house disease. It is contagious. The knowledge of these facts causes uneasiness to people who live under roofs which they do not control and who have to change their places of abode at frequent intervals.

Fear of contagion on the part of guests has driven hotel-keepers and boarding-house keepers to close their doors to consumptives. This is a great hardship on people who already are much afflicted, and is unwarranted. Proper regulation of the conduct and habits of consumptive guests would give ample protection.

People who live in hotels and boarding-houses run less risk of contracting tuber-

culosis from fellow-guests or guests who have preceded them than they imagine. Implantation of tuberculosis is not at all easy.

It takes some time to produce an environment fertile enough to implant the tubercle bacillus. It also takes some time to get an implantation from such an environment when it is fertile.

There is really no danger of taking tuberculosis from a fellow-guest in a hotel unless there is a very intimate relationship. The contact which ordinarily exists between guests in hotels is not close and prolonged enough to produce an implantation.

The danger of taking tuberculosis from a preceding guest in a hotel ordinarily is not very great either. Hotel life usually is too transient both for producing a fertile environment and for taking an implantation.

The consumptive who occupies a room in a hotel seldom stays long enough to produce a contagious environment. The

healthy person who follows him does not remain long enough to get an implantation.

An exception to this rule probably is to be found in health-resorts, where hotels are frequented for the purpose of regaining health. Consumptives remain long enough in such hotels to produce a contagious environment and other guests remain long enough to get an implantation.

In such hotels, too, subsequent occupants frequently are predisposed to tuberculosis by reason of bad health from some other cause. They may have been attracted to the place by its reputation as a health-resort.

People frequently go to health-resorts while convalescent from some acute disease. Many of the acute diseases are looked upon as predisposing causes of consumption.

Tuberculosis no doubt occasionally gets into a family by way of the hotel among wealthy people. All in all, however, the

hotel probably seldom is the means of spreading the disease.

Boarding-house life is more fraught with danger of getting tuberculosis than is hotel life. The conditions for producing environment and for implantation both are better.

The population of boarding-houses is more permanent than that of hotels. In proportion as occupancy is longer, the chances of producing contagious environment and getting implantations are better.

In a boarding-house a consumptive is almost certain to occupy his room long enough to produce a contagious environment. Likewise a subsequent occupant is apt to stay long enough to get the disease.

There also is some danger in a boarding-house of getting tuberculosis from a fellow-boarder. The boarding-house is something like the home. The inmates are all as of one family. Contact is more or less intimate between all.

Life in a boarding-house, moreover, to

some extent predisposes to tuberculosis. Cooking often is bad and food is of an inferior quality.

To some extent, too, people who live in boarding-houses are predisposed to tuberculosis by occupation. Frequently they are overworked.

In neither boarding-houses nor hotels, however, is there enough danger of contracting tuberculosis to warrant exclusion of those who are suffering from the disease. Better protection can be given by kindness than by cruelty.

CHAPTER XXIV

The Spread of Tuberculosis by Consumptive Servants

CONSUMPTION largely is a disease of the poor. The conditions of life and the environments of the poor strongly predispose to it and present excellent opportunities for the spread of contagion.

Well-to-do people are not exempt from the disease, however, although, considering all things, one might well expect them to be. They live under conditions and environments which ought to shield them against contagion and prevent them from developing the disease after getting an implantation.

Their houses are well situated, large, well ventilated, and clean. They have all the necessaries of life and even luxuries. They

are exempt from the many predisposing causes which grow out of poverty.

Their only predispositions are those which are natural and those which grow out of dissipation. Excessive eating and drinking and loss of sleep probably constitute their chief acquired predisposing causes.

Their mode of life exempts them from contagion in many respects, but not in all. At some points they are much exposed. Such points of exposure often are overlooked.

All society hangs together. At the point of cleavage the rich are exposed to the same contagions as the poor.

Domestics of all kinds are prone to tuberculosis. When they have the disease, they usually hold on to their positions until it is far advanced. They can do so because their work is relatively easy.

Domestics, from the very nature of things, constitute part of the household of their employers. They enter into the most inti-

mate relationship with members of the family. For the purposes of contagion they are part of the family.

Children of wealthy parents often are in closer contact with domestics than they are with their own parents. They eat and sleep in the same room with them and often are fed and caressed by them.

A nurse-girl with consumption creates an amply fertile environment of contagion for the children under her care. The children can hardly escape getting an implantation.

Implantations which take place under such circumstances may not grow into consumption until later in life. Sometimes they do not develop enough to show themselves until old age.

The consumptive chambermaid has every opportunity of contaminating the bed-rooms of the family in which she is employed. Contamination of this kind is not apt to be very intense, however. It probably would

not give implantations except to those who are much predisposed.

The consumptive cook, waiter, and butler are liable to contaminate the food which they prepare and serve to the families of their employers. They may do this in handling the food and also by producing a contagious environment in the kitchen, dining-room, and pantry.

Consumptive domestics, as a rule, have no homes other than those of their employers. Quite naturally they make every effort to keep these homes when they are ill.

In order to escape prejudice, they keep the nature of their ailments from their employers as long as possible. In this effort at concealment lies the greatest danger.

Preventive measures against tuberculosis cannot be practised without attracting attention. Broken-down tissue, therefore, is deposited in handkerchiefs and in out-of-the-way places, because this can be done in concealment.

In the hands of the domestic the handkerchief is perhaps even a greater source of danger than it is in the hands of other people. Domestics constantly handle things of every kind and description, and with soiled hands they contaminate everything they handle.

CHAPTER XXV

The School-room in the Spread of Tuberculosis

CHILDREN of school age have a very low death-rate from consumption. Statistics show that the lowest death-rate from the disease is in the age-period between five and fifteen years.

This, however, does not mean necessarily that children of this age-period do not get implantations. The implantation may take place and the full-fledged disease may not follow until adult life.

Statistics, moreover, may not tell the whole truth about the death-rate from consumption in childhood. Tuberculosis oftener travels in disguise during childhood than during adult life.

Many of the deaths in childhood which

are recorded under the names of convulsions, inanition, diarrhea, inflammation of the brain, and inflammation of the bowels really are caused by tuberculosis.

There are many forms of tuberculosis in childhood, too, which do not appear in the statistics of deaths from consumption. Among these are tuberculosis of the bones and lymphatic glands. Usually they end in consumption in adult life.

Teachers are quite prone to consumption. They are predisposed by overwork and malnutrition. Their work is hard and they are underpaid.

Whatever contagion of tuberculosis there may be in the school-room probably comes mainly from the teachers. Even when children have tuberculosis they are not apt to have it in a contagious form.

Teachers as a rule are clean and refined. These very qualities, however, lead them into dangerous habits. For ethical reasons they spit into handkerchiefs. Through

handkerchiefs they contaminate everything about them.

A consumptive teacher may spread contagion by creating a fertile environment in the school-room and by contaminating those things which pass between him and the children. The fertility of the environment and contamination depend upon the habits of the teacher.

Ordinarily environment created by a consumptive teacher is not likely to be fertile enough to give rise to implantations among the pupils. School-rooms, as a rule, are too large to become fertile in every part and pupils are not very close to the teacher.

There is more danger, however, of children getting implantations from things which have been handled by the teacher. The hands of the children get smeared in this way and the tubercular matter may find its way into their stomachs with their food when they take their luncheons.

Consumptive teachers may give the dis-

ease to other teachers. The contact between teacher and teacher is closer than that between teacher and pupil.

Consumptive pupils, when they do exist in a school-room, are a greater source of danger to other pupils than are consumptive teachers. This is because they are in more intimate contact with them.

School-rooms really are not a prolific source of spreading tuberculosis. Pupils do not have the disease often in contagious form, and teachers, when they do have it, are not very apt to give rise to an environment or contamination capable of giving the disease to others.

Schools may indeed be a protection to children against tuberculosis under certain conditions. Among the very poor, when there is tuberculosis in the child's home, the child is much safer at school than at home.

The hours which the child spends in school each day may give sufficient truce

in the battle against the tubercle bacillus to enable the child's organism to win out in the struggle against implantation. They break the continuous exposure which the child otherwise would have to undergo in its home.

CHAPTER XXVI

Churches and Public Halls in the Spread of Tuberculosis

CONTACT is the dominating factor in the spread of tuberculosis. Without it the disease cannot be propagated.

Mere contact, however, is insufficient. There must be a certain amount of it. Quantity as measured by time, therefore, likewise is an essential factor.

How long contact must endure to give implantation cannot be determined even approximately. Too many other factors enter into the calculation, such as immunity, predisposition, sanitation, and fertility of contagious environment.

It unhesitatingly may be said, however, that contact under certain circumstances

and conditions is too short to permit of implantation. This statement, moreover, applies to both direct and indirect contact.

Contact, for instance, of half an hour, or perhaps even of two and three hours, probably would not give rise to implantation under any circumstances; and contact of a day, of two or three days, and perhaps even of a week or two, under certain conditions and circumstances might not be followed by implantation.

In churches and public halls contact with consumptives always is brief. People do not remain in such places long and they visit them only at intervals.

Exposure to a consumptive in a church or public hall for an hour or two could not give rise to an implantation even in the most susceptible person. The element of time would be wanting.

Even if the consumptive were ever so unclean and unmannerly and the sanitary condition of the church or hall were ever

so bad, the shortness of time would not permit of an implantation. It would be like an underexposure in photography—it would not develop.

Consumptives who spit into handkerchiefs may contaminate the pew or chair in which they sit in church or hall. Their clothing contains tubercle-laden dust and their hands are smeared with tubercular matter. They are bound to contaminate every place which they occupy.

The contamination which they can give a pew or chair in an hour or two, once or twice a week, is too attenuated, however, to set up a fertile contagious environment. The environment which is created probably could not convey tuberculosis even to the most susceptible.

Consumptives who spit on the floor of a church or hall create a more dangerous environment than do those who spit into handkerchiefs. The sputum dries on the floor, disintegrates, and becomes pulver-

ized, and then is distributed by the broom of the janitor or cleaner.

The amount of sputum which can be ejected upon the floor of a church or hall by an occasional consumptive attendant is not sufficient, however, to produce a fertile environment of contagion for the whole church or hall. The danger does not extend far beyond the place where the consumptive sits.

Even the exact spot in which he sits probably would not be fertile enough to give an implantation to persons sitting in it subsequently. The contagion necessarily would be weak and the length of time of occupation by subsequent visitors would be short.

The only persons who really are likely to get tuberculosis in a church or hall are janitors and cleaners. Tubercular matter which has been deposited on the floor is stirred up by them and inhaled while cleaning.

They are exposed to the contagion every time they sweep and dust, if there has been any tubercular matter deposited in the church or hall. As they sweep and clean pretty often and at regular intervals, they ultimately accumulate enough bacilli to overcome resisting power, and thus get an implantation.

Janitors and cleaners of churches and halls frequently are victims of tuberculosis. They no doubt get the disease through their occupation.

People at large probably never get tuberculosis in church or hall. The popular fear of catching the disease in such places has no foundation in scientific facts.

CHAPTER XXVII

Public Conveyances in the Spread of Tuberculosis

FOR the spread of tuberculosis contact must be continuous. Casual contact is not sufficient. Neither will intermittent contact do, if the intermission is long and the contact is short.

To get tuberculosis one must live with the person who has it, live in the place in which such a person has lived, or continuously use something which has been used by such a person for a long time.

Even in the most fertile contagious environment one could scarcely take in enough tubercle bacilli at one time to get an implantation. The process is a slow

one. Ordinarily the bacilli must be taken in either with the air that is breathed or the food that is eaten.

At every avenue of entrance there is opposition to admission. Nature has placed guards at all ports of entry to keep out disease germs. Within certain limits these guards are competent to keep out the germs. They may be overpowered, however.

Within the human organism there is provision also for fighting off those disease germs which have run the gauntlet at the ports of entry. This disease-fighting power likewise may be overcome.

With acute diseases the number of micro-organisms given off ordinarily is so great as to be able to overcome all opposition at once. With tuberculosis the number given off is relatively so small as to require an accumulation to produce a contagious environment competent to overcome opposition.

Intermittency of contact therefore aids the human system in fighting off implantation of the tubercle bacillus. It gives a respite both to the guards at the ports of entry and to the disease-fighting soldiers within.

The length of time which ordinarily is spent in public conveyances by consumptives is insufficient to produce a fertile contagious environment. Such an environment therefore is apt to prove sterile, both while the consumptive is in it and after he has left it.

Even if the environment became fertile, the length of time ordinarily spent in it by healthy individuals would be too short and too intermittent to give an implantation. Not enough tubercle bacilli could gain admission into the system in so short a time to overcome the disease-fighting power of the organism.

Carriages, street-cars, railway cars, and boats of various kinds are looked upon by

the public as potent factors in the spread of tuberculosis. In truth they count for very little.

People who are employed in and about such conveyances are remarkably free from consumption. This they would not be if the conveyances were media of distribution of the tubercle bacillus.

On railroad lines over which many consumptives travel to health-resorts there may be some slight danger of getting implantations in sleeping-cars. Even here, however, the exposure is ordinarily too short for implantation.

A somewhat longer exposure takes place in boats, in which people sometimes spend weeks. To occupy a cabin for a few weeks with a consumptive or after him undoubtedly gives opportunity for implantation. Even here the danger is lessened by the time spent on deck.

Fertile contagious environments really are seldom produced in public convey-

ances, even on boats, except perhaps among sailors. Among these the conditions on board are the same as are the conditions among land-people in their homes.

CHAPTER XXVIII

The Chances of Getting Tuberculosis on the Street

RAIN, sunshine, and fresh air are the natural enemies of the tubercle bacillus. The rain disintegrates the tubercular matter, which is the caché of the bacillus. Sunshine and fresh air kill the bacillus.

When tubercular matter is ejected in the open, where it is exposed to the weather, it soon becomes devitalized. Even when there is no rain, disintegration goes on rapidly by the process of decomposition.

How long it takes tubercular matter to become devitalized in the open air has not been definitely determined. The probabilities are that it takes only a few days, or at most a few weeks.

Even if it takes a few weeks, accumulation of tubercular matter on the street and

in the open to a degree of fertile environment is impossible. It would take a great deal of tubercular matter to produce a contagious environment outside.

The number of contagious consumptives who walk the streets of a large city or who are in the open anywhere is, after all, relatively small. There probably is not one to the block, even in the poorest and most crowded districts.

In large cities there is one contagious consumptive to every three to five hundred people. The amount of tubercular matter which this one person can eject while out of doors, even during the most contagious period of his disease, is of little consequence in an area inhabited by so large a number of people.

It is questionable whether a consumptive could produce a fertile environment out of doors even in the dying stage of his disease and within a limited area. The tubercular matter becomes devitalized before

it can be broken up fine enough to be inhaled or be deposited on food.

Thoughtless men have inflamed the public mind with fear of tuberculosis by preaching the doctrine of the ubiquity of the tubercle bacillus. All outdoors, where there are consumptives, say they, is swarming with tubercle bacilli.

As there are consumptives everywhere, there must be tubercle bacilli everywhere. Not only are the churches, public halls, cars, railway trains, and boats full of them, but the parks, streets, and public highways are swarming with them. Wherever a consumptive goes he leaves a trail of them.

How can it be otherwise? A particle of tubercular matter the size of a pinhead contains millions of tubercle bacilli. A consumptive sometimes ejects pints of tubercular matter in a day.

Alas, this Micawber philosophy! There are so many bacilli in a pinhead's worth of matter; there must be so many in a pint.

There are so many pints of matter to the consumptive, and so many consumptives to the block; therefore the tubercle bacillus must be everywhere.

No allowance is made in this wonderful calculation for anything except arithmetic and the tubercle bacillus. Rain, sunshine, fresh air, devitalization, and the life-history of the tubercle bacillus count for nothing.

The tubercle bacillus is not everywhere. Outdoors it is, relatively speaking, in very few places, and in those only in gross tubercular matter. Accumulation of tubercle bacilli outdoors is difficult because of the continuous process of disintegration and devitalization which goes on everywhere in the open air.

Free tubercle bacilli cannot live in the open air. The probabilities are that they even cannot live long in finely pulverized tubercular matter. There is little chance, therefore, for living tubercle bacilli to float about in the outside air.

It unhesitatingly may be said that there is no chance of getting tuberculosis on the street or in the open air. Not enough living tubercle bacilli can be taken in to give an implantation.

Fear has been expressed that women may take up enough tubercular matter from the pavements on their trailing skirts to contaminate their homes and produce fertile contagious environments. Practically this is impossible.

A woman with trailing skirts undoubtedly may pick up tubercular matter from the pavement. The amount which she can pick up in this way, however, even if it were all shaken out in a sleeping-room, would not produce an environment fertile enough to give implantation.

An environment fertile enough to give implantation of the tubercle bacillus is not easily produced. How difficult it is may be inferred from the relative number of implantations to environments.

In a community in which occur twenty-five hundred deaths a year from consumption there probably are at least five thousand contagious cases at all times. At least four people are intimately and continuously exposed to every contagious case. There are therefore twenty thousand people exposed.

Allowing for recovery in two-thirds of all the people who get the disease, there can at most be only eight thousand implantations in a year. This means that only about one out of every three people who are exposed even intensely gets the disease.

CHAPTER XXIX

Are Human and Animal Tuberculosis the Same?

THE discovery of the tubercle bacillus brought within reach of science secrets about tuberculosis which, without it, must have remained hidden. It did this by giving an exact basis of comparisons.

With the tubercle bacillus as the basis of operation it was easy to trace the ramifications of tuberculosis throughout the entire animal kingdom. The disease has been searched for and found in almost every form of animal life.

One of the first places in which it was looked for and found was in cattle. The disease known as "pearl disease" or "pearly disease" was proved to be tuberculosis.

Investigation moreover brought to light the fact that tuberculosis is a very common disease in cattle. Entire herds were found to have the disease.

Dairy herds in particular were found to be prone to the disease. The higher bred the herd and the better the cows as milkers, the more prone they were found to be.

It was found, too, that apparently there was some relationship between domesticity of animals and tuberculosis. The farther animals were removed from the wild state, the more prone they seemed to be to tuberculosis.

Some observers at once jumped at the conclusion that tuberculosis in animals was due to association of the animals with man. In fact, it was thought that man gave the disease to animals.

Others reversed the situation and concluded that man got tuberculosis from cattle. The fact that man ate meat and

drank milk was sufficient evidence with these to warrant their conclusion.

So generally did these latter views come to be held that measures were inaugurated all over the world for the suppression of tuberculosis among cattle, with the avowed purpose of stamping out the disease among human beings. Governments took up the matter.

Bureaus were established for the inspection of dairy herds and laws were passed for the condemnation and destruction of cows suffering from tuberculosis. With the discovery of tuberculin a refined test was furnished by which incipient cases could be searched out.

Herd after herd of the finest milk cows thus has been destroyed in the mad stampede to save human beings from the great white plague. Oftentimes, too, the destruction went on when the herd was healthy to the eye but merely sick to the tuberculin test.

Alas, that science should be such a laggard and sophistry so fleet of foot! As the chasms which deductions overleaped are slowly being bridged over by scientific research, it begins to look as though identity of human and animal tuberculosis after all does not necessarily mean intertransmissibility.

Herein lay the mistake. The identity of human and animal tuberculosis was interpreted to mean intertransmissibility as well. Color was given to this deduction by the close relationship between man and domestic animals.

Once having jumped at the conclusion, it was easy to find arguments to support it. Plausible evidence was at hand everywhere.

Man and the cow were most afflicted with tuberculosis. They were interdependent. The consumptive dairyman gave the cow tuberculosis. The consumptive cow gave milk and meat to man. What more natural than that she should give him tuberculosis?

Gradually science is clearing up the whole matter, although the last word cannot be spoken as yet by any means. So far as exact knowledge goes, it looks as though the deductions which have been made were premature.

So much only is certain: the tubercle bacillus which grows in the human body and the tubercle bacillus which grows in animals undoubtedly are one and the same micro-organism modified by the soil on which they grow.

The modification is shown in form, in virulence, and in predilection for soil. Perhaps more exact knowledge of these modifications may some time later bring us the power of identifying soil by the bacillus itself.

It is pretty well settled, too, that the tubercle bacillus by the modifications which it undergoes becomes indigenous to the soil on which it grows. When it has grown on a certain soil for a certain

time, it apparently loses its adaptability to other soils.

It is true that the bacillus which has become indigenous to human soil can be made to grow on animal soil. It does not take root readily, however, and it grows poorly when it has taken root.

Many experiments have been made on all kinds of animals to elucidate this subject. In all it has been evident that animals are not congenial soil for human tubercle bacilli.

It has not been possible, on the other hand, to make experiments to test the congeniality of human soil for animal tubercle bacilli. But in a few instances accident has supplied the information which such experiments would give.

Veterinary surgeons and butchers have accidentally inoculated themselves with animal tuberculosis. The growth which has followed such inoculation has in every instance been benign.

All of the cases recorded recovered upon excision of the growth. In one case only did death occur, and in this it was uncertain whether or not the person had been exposed to contagion of human tuberculosis.

Human and animal tuberculosis undoubtedly are one and the same disease. They are intertransmissible by artificial methods; but they probably seldom are intertransmitted in the natural way.

CHAPTER XXX

Tuberculosis from Meat and Milk

MAN is an omniverous being. He can eat all kinds of food. By nature he is a meat-eater as well as a grain-eater and a grass-eater.

Meat at all times has been an important article of diet for him. It has stood next to bread as a staple.

Milk is the food of children and invalids. It is the staff of life to the young and the weak.

For the sick it is more than medicine. It is the one food upon which the crippled organism, when sick, can be coaxed back to health.

Meat and milk are too important in the human dietary to be stigmatized without reason. They should not be libeled.

The advocates of radical measures for eradication of tuberculosis among cattle have unsettled the public mind about the consumption of meat and milk. Many people are afraid to use them any longer.

The movement to eradicate tuberculosis from dairy herds is one which merits unanimous support. There has been a mistake made, however, in predicating it upon eradication of tuberculosis from the human race. It should stand on its own merits.

Whether meat and milk can be media of conveying animal tuberculosis to human beings is still a mooted question. In the light of our present knowledge we can only say: theoretically, they can be; practically, probably they are not.

Meat as eaten usually consists of the muscular tissue of an animal. Muscular tissue never is the seat of tuberculosis. Muscular juice, however, may contain tubercle bacilli. The bacilli probably are in the blood. The number thus situated

necessarily must be relatively small, however.

Meat as a rule is washed and cooked before being eaten. When eaten raw, it usually is first put through a process of drying, pickling, or smoking. Any of the processes of preparing meat for eating probably attenuates tubercle bacilli if it does not kill them.

Milk is more likely to contain tubercle bacilli than is meat. Even milk, however, relatively is little exposed to contamination.

Milk, being a secretion, is protected against contamination unless the udder of the cow is diseased. Tuberculosis of the udder is rare. When it occurs, the cow becomes useless as a milker and is apt to be discarded.

Advanced tuberculosis of any form seriously cripples the cow as a milker. All such cows usually are removed from dairy herds because they no longer are worth keeping.

It has been proved by inoculation experiments that tubercular milk diluted one to fifty becomes sterile. One cow with tuberculosis of the udder in a herd, therefore, probably would not contaminate the milk sufficiently to give implantations, even under the most favorable circumstances.

Feeding experiments with tuberculous meat and milk have been made on susceptible animals. The results were about one implantation for every three animals fed.

The gastric juice has an attenuating influence on the tubercle bacillus. Bacilli which have been subjected to the gastric juice do not take root well and have poor growth.

Meat and milk which contain tubercle bacilli therefore undergo a further reduction of fertility by the process of digestion. They indeed may be made absolutely sterile.

The feeding and inoculation experiments were made on animals which are quite sus-

ceptible to animal tubercle bacilli. Human beings probably are not susceptible to animal tubercle bacilli.

At most, therefore, human beings would not be more likely to get tuberculosis from the use of meat and milk than are animals. All the facts at our command seem to indicate that they would be much less likely to do so.

When animals have been fed tuberculous meat and milk for experimental purposes, they moreover have been kept on such diet constantly, and the meat and milk have been selected on account of their tuberculous qualities. In practical life, with human beings, tuberculous meat and milk are never taken as a steady diet, nor are they selected for their tuberculous qualities.

Perhaps the strongest argument, however, which can be advanced against the view that meat and milk are a source of seed supply for human tuberculosis is to be found in clinical experience. No indisputa-

ble case has been put on record in which human lung tuberculosis has been contracted by the use of meat and milk.

Cases of glandular and bone tuberculosis have been recorded which were believed to have been contracted in this way. In none of them, however, was there more than circumstantial evidence, and in none could contagion from human sources be excluded.

So far as milk is concerned a strong argument against the view is at hand in the low death-rate from tuberculosis in childhood. The lowest death-rate from tuberculosis is during the age period when children are most dependent on cow's milk for their food.

In the light of our present knowledge, therefore, it unhesitatingly may be said that there is practically no danger of getting tuberculosis from the use of meat and milk. It even is quite possible that a liberal use of these articles of diet gives a certain protection against the disease.

CHAPTER XXXI

How the Tubercle Bacillus Gets into the System

IT IS well understood how the tubercle bacillus gets out of the system. Science has had ample opportunity of studying this. The entire process lies before us like an open book.

Not so with the entrance of the tubercle bacillus into the system. Much of our knowledge upon this subject is theoretical. We know how it may occur, but we do not know exactly how it does occur.

Experiments on animals have shown that the tubercle bacillus may enter by the skin, by the lungs, and by the stomach. Animals have been inoculated with tubercular matter, have been made to inhale it, and

have been fed on it. All of the methods have given implantations.

It is believed that in human beings entrance takes place by all three methods. Entrance by the skin, however, is believed to be exceptional, and to occur only when an abrasion exists.

Entrance by the lungs is regarded as the most frequent method. This view no doubt has been accepted partly because the lungs most frequently are the seat in which tuberculosis is first detected.

Entrance by the stomach likewise is looked upon as a frequent method. In more recent years it is given first place in the order of frequency by many observers.

At all of these ports of entry nature has placed obstacles to the admission of disease germs. These obstacles are greater or smaller according to the openness of the port.

In the skin the lymphatic system stands guard. When the skin is broken and dis-

ease germs get into the wound, the lymphatics, which are small vessels, at once gather them up and carry them into the nearest gland, there to destroy them if possible.

If the number of disease germs is large or if they multiply very rapidly, they overcome the guards and spread throughout the system. With acute diseases this usually is the case.

When the tubercle bacillus enters by the skin, it seldom gets far beyond the port of entry. From its first location, however, it may spread to other parts.

At the port of entry by way of the lungs nature has placed many obstacles, probably because it always is open. We breathe all the time, by night and by day, and in all kinds of places.

The lungs are meant by nature to admit gaseous substances only. Nature therefore has so formed and shaped the nose and throat as to obstruct solid matter at every turn.

She moreover has placed stiff hairs inside of the nose to act as a sieve, and has dotted the mucous membrane with glands which secrete a viscid mucus to carry off solid matters that may be deposited on the membrane.

All along the respiratory tract she has paved the mucous membrane with small cells which have tiny little arms or antennæ. All of these move outwards so as to be able to carry out solid matter.

All along this tract, too, there are thousands of little mouths which empty into the lymphatic vessels. These little mouths suck up any solid matter which may have entered and have escaped ejection.

Tubercular matter, to get in by way of the lungs, must be finely pulverized. It cannot go in unless it is. It must be so impalpable as to be readily suspended in the air.

Most of the matter which goes in with the air is deposited on the mucous mem-

brane of the respiratory tract, and is again ejected with mucus. Some finds its way far down into the bronchial tubes, however, and resists ejection.

The matter which remains in the tubes is disintegrated by the mucus, is taken up by the lymphatic mouths, and is carried into the lymphatic glands, which are numerously located alongside of the bronchial tubes. Here the tubercle bacilli, having been shelled out of their hulls, so to speak, are ready to germinate.

The lymphatic glands are believed to possess the power of destroying disease germs. The disease-fighting power of these glands may be overcome, however. Then a colony forms and the tuberculosis begins.

When the tubercle bacillus enters the system by way of the lungs, the beginning of the tubercular process is always in the bronchial glands. From these glands the process extends to the lung tissue itself.

The struggle of the system against colonization of tubercle bacilli may go on for years in the bronchial glands, without symptoms, before victory is gained for one side or the other. Tubercle bacilli which gain admission into the glands in childhood may colonize only in adult life, and even in old age.

The port of entry by way of the stomach also is well guarded against admission of disease germs, but not as well as that by way of the lungs. The stomach is the natural port of entry for solids, and tubercular matter is solid matter.

When tubercular matter is mixed with food it gets into the stomach with the food. When it is deposited on the mucous membrane of the throat during respiration, it is carried down into the stomach with food and drink.

In the stomach the tubercle bacillus meets its first obstacle at this port. It has to run the gauntlet of the gastric juice, which has some germicidal qualities.

It has been proved by experiment, however, that tubercle bacilli sometimes are merely weakened by the gastric juice and not destroyed. When digestion is weak, they even may escape injury altogether.

Very few people have perfect digestion all the time. There are times, therefore, with every one when the tubercle bacillus may pass through the stomach unharmed.

Many times, no doubt, the gastric juice merely serves to disintegrate tubercular matter and set the tubercle bacilli free from their caché. The bacilli thus get into the intestines hulled and ready for germination.

In the intestines the bacilli still are outside of the system and outside of congenial soil, however. They still must run the gauntlet of the little mouths which suck up the food particles and which have certain powers of selection.

That tubercle bacilli, however, may be taken up by these little mouths with the

food particles and thus get into the circulation cannot be doubted. Physiologically the alimentary canal is the shortest route into the circulation from the outside world for solids.

When there is an erosion of any kind in the mucous membrane of the intestines, the bacilli may be taken up by the lymphatics of the intestines and carried into the mesenteric glands. This no doubt frequently happens, especially among children.

We then have what is called marasmus or inanition. The child wastes away without any apparent cause.

When the tubercle bacillus gets into the system by way of the stomach, it may be carried by the blood to any part of the body before it finds a resting-place and a proper soil for germination and growth. When it finds such a place, it colonizes and we have the beginning of tuberculosis.

This is why we may have tuberculosis primarily in any part of the body which has

a blood-supply. The part of the body which is the point of least resistance offers the resting-place and the congenial soil for the tubercle bacillus.

CHAPTER XXXII

The Natural Course of Tuberculosis

TUBERCULOSIS is a tedious, long-drawn-out disease, slow in its inception, slow in its development, and slow in its termination. It is slow and tedious because it is local, and does not poison the nervous system rapidly and intensely.

It always begins in a small way, and gradually extends, gathering strength as it goes. It gives off a little poison all the time, but not enough to create much disturbance. It apparently soothes the nervous system into tolerance as it goes.

Like the ivy which climbs up the side of the house, it begins as a mere speck, but extends and gains in rapidity as it grows. In the end it destroys so much tissue as to make the body unfit for life.

After certain progress it assumes a form which materially differs from that under which it begins. Under this new form it is known as consumption. Its course, therefore, may be divided into two epochs.

As consumption it terminates its existence with the death of its victim. It gives off the seed which is to be sown on other soil.

During the first epoch it rarely is recognized. The symptoms are so insignificant that the victim does not, as a rule, consult a physician.

He may realize that he is not in good health. His family and friends may comment on his not looking well, on his getting thin, and his not being himself.

He easily explains all these matters to himself, however. He has been doing extra work, he has had some unusual annoyances or some great worry. All will come right when he gets through with his rush or when his mind has been relieved.

If his appetite is poor, he blames it on his food or on the cook perhaps. He recalls that he has been overloading his stomach lately. All he needs is to be careful about his diet for a while.

If he finds himself a little feverish and flushed at times, it is because he has been unduly excited, has taken a little cold, or has overworked himself a trifle. If he is chilly, the weather or his clothes are at fault.

If he is unusually fatigued or has pain, he is getting rheumatism or has malaria, he is working too hard, or the weather is unseasonable. These things will all come right in a little while, he knows.

This abnormal condition, which is neither health nor disease, goes on indefinitely, a little better now and a little worse again. It is not bad enough to warrant interference, and usually a physician is not consulted unless a cold, influenza, pneumonia, pleurisy, or some other disease intervenes.

Even an intercurrent disease may not bring the tuberculosis to light. The physician's attention is so riveted on the intercurrent trouble that he cannot see beyond it. He is able to explain all the symptoms satisfactorily to himself by the intercurrent disease.

Self-deception is quite easy in these cases because the intercurrent disease cloaks the tubercular process. The tuberculosis really must be looked for to be found.

After the intercurrent disease has passed off, health seems to be better. Contrast probably makes it appear so. This still further deceives the victim.

Quietly the tuberculosis goes on extending further and further into healthy tissue. Bad health has become the ordinary condition and no longer arrests attention. Intercurrent diseases produce temporary alarm, which subsides as they pass off.

The duration of the first epoch varies with different individuals. It may be a few years, it may be a lifetime. It seldom is less than a few years.

Transition into the second epoch may be sudden or gradual. Occasionally it is by a violent outburst of illness with severe chills, high fever, and terrible sweats.

This is called galloping consumption. The sickness comes as though it dropped from heaven and runs through its course like a whirlwind. Under these circumstances the poor health epoch usually is lost sight of in the virulence of the subsequent attack.

The tuberculosis really had existed for years unrecognized. It was in some obscure corner of the body, perhaps in some lymphatic gland.

The small patch ripened, the seed was emptied into the circulation, it was sown in every part of the body, and such a tremendous crop sprung up as to

poison the nervous system and destroy life at once.

Such universal growth probably occurs in persons only who have a strong predisposition to the disease. In proportion as there is immunity, extension of the disease from the first little spot is slow.

In persons who have strong immunity, recovery frequently takes place during the first epoch without it being discovered that they have the disease. The tendency to recovery is very strong.

Ordinarily, the second epoch comes on in mild form and is ushered in by a severe intercurrent disease, such as pneumonia, pleurisy, or influenza. The intercurrent disease does not end in recovery, but gradually fades into consumption.

To the lay mind the intercurrent disease has turned into consumption. In reality it only has been the cabinet in which the tuberculosis transformed itself into consumption.

Sometimes the transformation from tuberculosis into consumption is more gradual and less dramatic. In such cases it usually takes place under cover of a cold.

The symptoms of consumption are well recognized. They are chills, fever, sweats, cough, expectoration, emaciation, loss of appetite, and extreme weakness.

These symptoms continue in milder or severer form, with occasional intermissions, throughout the entire second epoch. When the intermissions are long, as they sometimes are, there is some improvement.

The tendency, however, is always downward. From one exacerbation to another, as the severe attacks are called, each is a rung lower in the ladder of health. Ultimately an attack proves fatal.

The duration of the second epoch is from six months to as many years. The dying end of it usually is about two months.

CHAPTER XXXIII

Tuberculosis is a Curable Disease

HIPPOCRATES twenty-five hundred years ago said that all consumptives die. The world has kept on saying the same thing ever since. Even the medical profession, as a body, has subscribed to the verdict.

The verdict is wrong. It is based on incomplete evidence. It was reached at the bedside of the dying consumptive.

Hippocrates did not know tuberculosis except in the form of consumption. He did not recognize the disease in its larval and chrysalis stages, but only when it was a full-fledged butterfly.

His conclusions were based on dying cases. Of the dying stage of the disease his verdict still holds good and ever will,

because the disease does not prove fatal until so much tissue has been destroyed that life is no longer possible.

The world has accepted Hippocrates' verdict because it has been able to verify it at the bedside of the dying consumptive. No one has seen a dying consumptive get well, therefore tuberculosis always is fatal. Such is the reasoning.

When a person with symptoms of tuberculosis has recovered, it has been accepted as evidence that he did not have tuberculosis. A consumptive cannot recover; therefore a person who has recovered could not have had consumption.

From time immemorial the medical profession, as a body, has abandoned the consumptive to his fate. It has smoothed his downward path with palliatives and has kept him in blissful ignorance of his doom.

To pretend to be able to arrest that downward course and to suggest meas-

ures for such an end were cried down as braggadocio and heresy. Men who did such things were shunned by their brethren.

Here and there in the history of medicine stands out a man who held out hope. He was as one crying in the wilderness, however, and he went down in oblivion. He was forgotten with his generation, and the verdict of Hippocrates lived on.

With more exact knowledge of the cause of consumption and of the course of the disease from its beginning to its end science has at last convicted Hippocrates of his error. It remains to convince his followers.

Tuberculosis is one of the most curable of all diseases. The tendency to recovery is so great that even without medical aid and in spite of disregard of all laws of nature more cases recover than end fatally.

Among the very poor in large cities

nearly every one gets tuberculosis. About one-third of all who get the disease die of it. The others when they die show evidence of having had it and of having recovered. This has been demonstrated on the autopsy table in charity hospitals.

The discovery of the tubercle bacillus has brought us clinical proof also of the curability of tuberculosis. It now no longer can be said that recovery is an evidence that tuberculosis did not exist, because the existence of tuberculosis is proved by the presence of the tubercle bacillus.

Living examples of cured consumptives, in whom the diagnosis has been scientifically established, are now to be encountered everywhere. The process of cure, moreover, can be seen on a large scale in sanatoria in every part of the world.

Seeing is believing with most people. Every cured consumptive becomes an

apostle of the new doctrine among the people with whom he associates. He raises the banner of hope.

Advanced medical science now holds out a strong helping hand to nature in its efforts to cure tuberculosis. Much has been learned about the treatment of the disease.

In the incipient stage practically all cases can be cured—the majority even without leaving home or giving up employment. Relatively few, however, are discovered early enough for this.

In more advanced stages the majority can be cured if proper conditions for treatment can be established, and can be maintained for a long enough period of time. Among the poor these conditions usually can only be established in sanatoria.

How far the disease must be advanced before it becomes hopeless cannot be determined definitely at the present time. Much depends upon how much tissue is

involved. When a number of organs of the body are affected and much tissue has been damaged, the case is hopeless.

In a general way, loss of body-weight gives a fair guide by which to gauge the chances of recovery. Loss of one-third of the body-weight is very near the point where all chance of recovery ends.

CHAPTER XXXIV

The Treatment of Consumption

SCIENTIFIC medicine no longer can be reproached with helplessness in combating consumption. It now places at the command of the physician an extensive armamentarium of efficient, well-tried weapons.

As yet there is no specific remedy for the disease; that is, there is no one remedy which will cure it every time. There are, however, many remedies which when skilfully used at the proper time help nature to win the victory in her struggle against the disease.

The treatment of consumption, according to modern ideas, consists in seeking to restore the entire organism which is upset by the disease to normal physio-

logical action. Whatever is deficient is made efficient.

This may be quite a complicated task. Every organ in the body may be deranged from one cause or another.

There is a slow poisoning of the nervous system, by the toxin of the micro-organisms. This poisoning stimulates some functions and depresses others. That which is overacting must be brought down, and that which is underacting must be brought up.

The local irritation set up by the growth of the micro-organisms causes disturbance and interferes with function. This disturbance and interference may extend even to neighboring organs.

One and the same nerve, for example, supplies both the lungs and the stomach. Irritation of the end of the nerve in one organ may disturb the function of the other organ.

Tuberculosis of the lungs therefore may

seriously interfere with the functions of the stomach; and overburdening the stomach with indigestible food may greatly handicap the struggling lung.

The stomach must be aided where it is handicapped and the lungs must be spared in the rush for nutrition. As much nutrition as possible with as little irritation as possible is the motto.

The growth of micro-organisms in the tissues of the body also interferes with the circulation of the blood. There is an impediment to the free passage of the blood, and the heart has to do extra work.

Overaction of the heart may cause rupture of blood-vessels in the lungs and bring on hemorrhage. It also may stimulate extension of the tubercular process.

The burdens of the heart therefore must be lightened so that the circulation may be kept within normal limits. The normal labors of the heart must be reduced

to compensate for the abnormal demands upon it.

The treatment of tuberculosis is not a matter of giving drugs so much as regulating the patient's life. Every action of the patient must be brought under control.

Not that drugs are useless. Many drugs are of value in regulating the abnormal action of disturbed organs of the body and bringing them back to normal functions. They must be used only when needed, however.

Taking drugs for the sake of doing something should be carefully avoided. Drugs may do harm as well as good. No drug should be used unless for a well-defined reason.

Close attention to details is the key to success in the treatment of consumption. Everything in the life of the patient must be shaped to one end—normal physiological action of every function of the body.

Whatever makes for nutrition makes for

recovery; whatever interferes with nutrition helps the disease. The nutritive system is nature's laboratory for the manufacture of its germicides.

Nutrition depends upon three factors—food, air, and expenditure of energy. The treatment of tuberculosis therefore hinges largely upon a sufficient amount of proper food, upon fresh air, and upon regulation of rest and exercise.

Tuberculins, serums, and vaccines, as curative agents, are still under judgment. They have value, but in the present state of their development are not specifics.

They should not be administered by inexperienced persons. Even the experienced should use them with caution.

Really only the well-trained expert can hope to get all that can be gotten out of the treatment of tuberculosis; for it is a difficult task. The general practitioner may succeed in easy cases, but he will lose out in many cases which could be cured.

CHAPTER XXXV

Food in the Treatment of Consumption

CONSUMPTION is a wasting disease. Its most striking feature is loss of tissue. Hence its name.

First the fat of the body disappears. Then the muscles begin to dwindle. The skin gets pale and the whole body degenerates.

Waste in consumption probably is due in part to interference with nutrition through poisoning of the nervous system, and in part to destruction of cells in the fight against disease. In part it also may be due to diversion of food from the tissues to the micro-organisms.

The tubercle bacillus, by the poison which it gives off and by the irritation

which it sets up, starts vicious circles of debasement in the body for its own good and the good of its associate micro-organisms.

The poisoned nervous system interferes with nutrition. Badly nourished organs do inferior work. Bad work leads to deterioration of the body. The damaged body becomes more susceptible to the poison of the tubercle bacillus.

The irritated nerves reflect a disgust for food or give rise to a depraved appetite. Abstention from food or use of improper food starves the organs. Badly nourished organs become irritable and are upset easily.

The vicious circles once started, go on making soil for the tubercle bacillus. The growth and multiplication of the tubercle bacillus continue to stimulate the vicious circles. The end is destruction of the invaded organism.

The first thing to be done in the treat-

ment of tuberculosis is to break into these vicious circles. They must be cut into somewhere.

The presence of the tubercle bacillus is the beginning of the vicious circles. Could we kill the bacillus, we would end the matter; but we cannot.

There is no way known to science of attacking the bacillus directly. The substances which are known to kill it in the laboratory also kill the tissues. We can only attack it indirectly.

The human body, however, has the power of manufacturing its own germicides when all its machinery is in good working order and the proper material is at hand. The thing to do then is to fix up the damaged machinery and to supply the required material.

Food is the material out of which repair is made in the human body. It is the source also from which the body draws its weapons against disease. The

way to break into the vicious circles, therefore, is to force into the system a large amount of easily digested food.

The food must be suited to the damaged machinery, however, because repair must be made through that machinery. Only such food should be used as can be transformed easily into tissue.

Enough nutrition must be provided for the body to meet all ordinary demands and at the same time the extraordinary demands of disease-fighting and repair. Energy also must be laid aside for emergencies from intercurrent diseases.

Food should be selected with a view to its nutritive value and its digestibility. The largest amount of nutrition with the smallest amount of labor should be the rule by which diet is regulated.

It is not so much a question of how much nutritive value is in a food as how much can be gotten out of it without fatigue to the nutritive system and irri-

tation to the lungs. Sometimes a food with low nutritive value gives better results than one with high nutritive value, because more can be gotten out of it without injury.

Milk is the best food at our command in the treatment of consumption. It has a relatively low nutritive value for bulk, but it gives an excellent return for the labor involved in metamorphosis.

It should be used as new and fresh as possible. The nearer milking time when consumed, the less the labor of changing it into tissue.

Milk deteriorates very quickly unless it is kept clean and sterile. It is a good culture-medium for micro-organisms, which make it indigestible and irritate the alimentary canal.

Milk should always be kept in sterile vessels. If the vessels cannot be sterilized by steam, they should be sterilized by dry heat in the oven or on top of the stove.

Eggs stand next to milk as an available article of food in the treatment of consumption. They contain a higher nutritive value for bulk than milk, but it costs more energy to extract the nutrition.

Eggs should be used raw if the patient can take them so. It takes less energy to digest them raw than cooked. A good way of taking them is to mix them with milk.

Next to eggs in the diet of a consumptive stands meat. There is more nutritive value in meat for bulk even than in eggs. Meat is hard to change into tissue, however.

Meat takes a long time to digest. For this reason the most easily digested meats should be selected and used only once a day. A large amount may be taken. It is better to take a large amount once a day than a smaller amount more frequently.

Vegetables and fruit should be used in the treatment of consumption on account of the minerals and acids which they con-

tain. They always should be fresh if it is possible to get them so.

Nuts are a valuable article of food in the treatment of consumption. They are rich in nutritive value. Some are easily digested. Almonds, English walnuts, pecans, and hickory-nuts may be used.

A good way of feeding a consumptive is to give him only one meal of solid food a day, and to supplement this with milk, eggs, fruit, and nuts. The meal may be taken in the middle of the day or in the evening.

The meal should consist of beefsteak, roast beef, or roast mutton, fresh vegetables, fresh fruit, nuts, and if desirable a cup of coffee or a little wine. It should be a good substantial meal. There should be no pastry and no dainties.

In addition to the one meal, the patient should consume not less than three quarts of milk and six raw eggs a day. The milk and eggs may be taken at intervals of two hours.

A consumptive's dietary may be something like this: A pint of milk before getting out of bed in the morning; another pint of milk and two raw eggs after rising and taking a bath; and a pint of milk and one raw egg at about ten o'clock in the forenoon.

When the meal is taken in the middle of the day, a pint of milk may be taken at three o'clock in the afternoon, a pint of milk and two raw eggs at six o'clock, and a pint of milk and one raw egg before retiring.

When the meal is taken in the evening, a pint of milk and two eggs may be taken at twelve o'clock instead of at six. Nuts and fruit may be used at any time of the day.

If the patient gets very hungry, he may have cereals in the morning and boiled rice for lunch or supper. These should not be allowed unless the one meal be eaten and enjoyed.

To some extent the diet of a consump-

tive must be regulated to suit his idiosyncrasies. Nothing should be used which gives indigestion, no difference how valuable it may be theoretically.

A practical test of the correctness of the diet in a given case is the weight record. If the diet is right there will be gain in weight. If there is no gain in weight, the diet probably is wrong.

With very delicate stomachs the food has to be predigested until such time as the stomach can take it in its natural state. Gradually the stomach acquires greater capacity for food.

With tactful perseverance persons who in the beginning can take scarcely any food can be brought to take from three to four quarts of milk and from six to twelve raw eggs a day and a good square meal besides. Under such a diet they rapidly regain their full body-weight.

CHAPTER XXXVI

Fresh Air in the Treatment of Consumption

IN 1861 Dr. Henry McCormac read a paper before the Medical and Chirurgical Society of Belfast on the fresh-air treatment of consumption. He was hooted at by his fellows and protests were entered against the reading of such papers.

It took a long time for the idea advocated by Dr. McCormac to percolate through the strong prejudice against fresh air which had grown out of the false doctrines about the cause of consumption. As consumption was held to be due to draughts and colds, it was hard to see how fresh air could have any other than a bad effect.

The idea was not lost, however. It was taken up by others, and it was put to practical test by Dr. Brehmer, himself a consumptive. Goerbersdorf Sanatorium grew out of it.

Sanatoria in which the fresh-air treatment was used sprang up in all parts of the world, the earliest ones all branching off from Goerbersdorf. In every one there was a practical demonstration that fresh air was of great value in the treatment of consumption.

The discovery of the tubercle bacillus and its associate micro-organisms as the cause of consumption also helped to break down the old prejudice against fresh air. Draughts and colds could not be the cause of consumption if the micro-organisms were.

Knowledge of the life-history of the tubercle bacillus as it accumulated confirmed the good opinion in which fresh-air treatment was held. The germicidal power

of sunlight and fresh air over the tubercle bacillus in itself gave sufficient reason for the treatment.

But even a better reason was found in the germicidal powers of the body, which greatly depend upon fresh air. The germicidal powers of the body depend on nutrition; nutrition depends upon metabolism, and metabolism depends on air and food.

Oxygen is the basis of all physico-chemical action in the body. Practically every function is more or less dependent upon it.

Food could not be transformed into tissue without it; used up material could not be carried out of the system without it; and the various fluids of the body which are necessary for different functions could not be made without it.

Oxygen as consumed by the body for physico-chemical purposes is supplied principally by the air which is breathed. Besides carrying in oxygen, the respired air moreover carries out products of com-

bustion. There is therefore a double reason why it should be fresh and pure.

How important air is to the human economy may be gathered from the short time during which one can do without it. One can live without food for days, and weeks, but without air for a few moments only.

The rapidity with which total deprivation of air proves fatal to the living body also gives us some idea of the injury which must come from a partial deprivation of it for a long time. This injury likewise comes when the air is of bad quality.

Air to be good for breathing purposes should be fresh outdoor air—air which has not been breathed before. Rebreathed air is poisonous to the human organism.

Air rids itself of impurities very quickly when in a state of agitation, but retains them for a long time when quiet. Outdoor air is therefore good and indoor air is bad.

Air which is shut up in a room soon be-

comes bad when breathed. It loses its oxygen and is loaded with products of combustion and impurities thrown off by the body.

Mixture with the outside air and agitation restores it and makes it good again. It is wonderful what powers of self-purification the atmosphere has.

In the treatment of consumption an ample supply of good fresh outside air, night and day, without intermission, is necessary. It must be had irrespective of weather and temperature.

Night air is just as good as day air, and perhaps a little better. In cities at least it is freer from dust and smoke than day air.

When possible, consumptives should sleep outdoors at night. If they cannot sleep outdoors they should make indoors as near like outdoors as possible.

Every window in the bedroom should be kept open. Blinds and shades should be taken down and shutters should be taken

off or thrown open. Sun and air should be allowed free access to the room.

There need be no fear of draughts. Without draughts the air in a room cannot be kept fresh and pure. Draughts can do no injury when a person is properly protected by clothing or bed-clothes.

Outside air is good anywhere. Even in cities outside air answers all practical purposes for the cure of consumption. Country air, of course, is freer from smoke and dust and is fresher and sweeter than city air; but city air, if it is outside air, is good enough.

Mountain air is believed to have special qualities of value in the treatment of consumption. These probably are more imaginary than real. It may be that mountain air, in certain cases, helps to bring about recovery by expanding the lungs more than usual.

Sea air sometimes is of value in the treatment of consumption, when the disease

is complicated with heart trouble. Such cases do much better at sea-level than in the mountains.

Climate in itself is of little value in the treatment of consumption. It is the outside air which counts, and it makes very little difference where this outside air is gotten from, so it is gotten every day and all the day and night.

CHAPTER XXXVII

Rest and Exercise in the Treatment of Consumption

THE false notion that consumption is in some way connected with inactivity has led to wrong conceptions about treatment of the disease which are shared by the medical profession and the laity alike. Exercise as part of the treatment is insisted on under any and all circumstances.

Frequently poor consumptives exercise themselves into the grave. The worst of it is that they do it under advice from the doctor and for the purpose of recovery.

Keep out in the open air is the order usually given. Unfortunately this is interpreted to mean, and perhaps is meant

so by the doctor, keep moving in the open air, either walking, riding, or driving. Among the poor it means keep working.

Exercise under certain circumstances and conditions is very prejudicial to consumptives. It often is the stumbling-block in the way of recovery. All the rest of the treatment may be good, but this one error counteracts all the good that is done.

If a consumptive is much below weight, he ought to be allowed to accumulate some energy before using up what he makes. His nutritive system may not be able to supply all the demands of the body and accumulate energy at the same time.

Fever is a great consumer of energy. When a consumptive has fever, he is apt to lose weight rapidly unless he keeps quiet. His fever may be increased, too, by exercise.

When the circulation is embarrassed by the heart pumping up against an obstruc-

tion, the embarrassment is greatly augmented by exercise. A pulse which already is much too rapid increases in rapidity.

Not only is the heart thus weakened and the nutrition of the entire body thereby interfered with, but the diseased tissue becomes congested and the growth of the micro-organisms is stimulated. Fatigue of the body is a fertilizer to the micro-organisms.

A single severe fatigue during the active stage of tuberculosis may be the turning-point from the road to recovery to the road to death. Many a consumptive has returned from a long walk or drive upon which he had entered as a good case with the death-mark upon him.

Sometimes a complication of pneumonia sets in after severe fatigue, which leaves the patient a physical wreck. Even if he picks up again, he will have lost much time.

For the consumptive in the active stage

of the disease absolute rest in the open air is necessary. This may be taken in bed or on a steamer-chair.

The temperature and the pulse-rate are the guide for how long this rest should be kept up. So long as the temperature goes up to 101° F. and above, and the pulse-rate up to 120 and over, there should be absolute rest.

As the temperature and the pulse-rate come down and body-weight increases, rest gradually should give way to exercise. At first the exercise should be passive, then active. Massage, carriage-driving, horseback-riding, walking, and severe physical exertion, in the order named, is the exercise which may be taken up. It always should remain within the bounds of fatigue.

Deep breathing is a form of exercise which may be begun relatively soon after acute symptoms have passed off. It always should be used when there are

no acute symptoms. It not only improves the muscles of the chest, but it helps the circulation and benefits nutrition.

Whatever form of exercise is adopted it should be added to daily in the same proportion and in small quantities. Five to ten minutes a day may be added according to the strength of the individual and the effect which exercise has on him.

As the patient grows in strength exercise really becomes an important factor in the cure. The heart action improves with exercise, and metabolism is benefited. Toward the end of the treatment the patient ought to do eight hours work a day.

CHAPTER XXXVIII

How Long it Takes for Consumption to Get Well

IN acute diseases the struggle between the invaded organism and the disease germ is intense but brief. Either the organism goes under or the disease germ is ejected, leaving behind immunity of shorter or longer duration.

In chronic diseases time and not intensity is the dominant factor. The struggle between the organism and the disease germ may endure a very long while without victory for either side.

From the very nature of things consumption must be long in getting well. The tubercle bacillus once in the system, grows and reproduces itself so long as it has soil, unless destroyed or thrown out.

Soil is not easily worn out because the disease is local and is slow in growth. Immunity is long in coming, and when it comes, often is of little use. Too much tissue has been destroyed to make recovery any longer possible.

Destruction of the tubercle bacillus by the disease-fighters of the blood can go on only so long as the invaded tissue has not been cut off from the circulation. This is recovery by phagocytosis and absorption. It is a slow process.

When the tubercles have been cut off from the circulation, softening takes place in them. An opening forms from the softened nodules to the nearest surface in contact with the air, and the broken-down matter is thrown out. The injured part then heals up and forms a scar. This process is much slower than the first.

When a very large amount of tissue close together is invaded, it all may break down at one time in the form of an ab-

scess and leave a large hole or cavity. The cavity becomes a culture-field for secondary micro-organisms.

For a cavity of this kind to heal up nature first must sterilize it and then contract it so as to bring its walls close together. When the cavity is in the lungs, the whole chest has to accommodate itself to the new condition of things. This is the slowest process of all.

Occasionally nature heals up a diseased organ by what is called fibrosis or hardening. The tissues are gradually changed into a condition in which they no longer can give sustenance to the micro-organisms. The process is exceedingly slow, and when complete may leave the organ so crippled as to make it almost useless.

Recovery by what is called encapsulation sometimes takes place. By this process the nodule is encased in a coating of lime and is thus entombed in the tissues, to remain there. Sometimes later in life

nature attacks the nodule, dissolves it, and throws it out, at the same time reintroducing the bacillus into the system. This process also is slow.

A consumptive may get well physically, without getting well scientifically. He may regain full strength and vigor and present the appearance of perfect health without being free from tubercle bacilli.

In this condition he is like an extinct volcano which may break out again. He has within him millions of tubercle bacilli which for the time being are harmless because they are locked up. If he maintains a high standard of health, he may go through life without their being set free.

Recovery is slow in tuberculosis even when the disease is in its beginning. It takes from three to six months under the most favorable circumstances. Even then there is uncertainty of the recovery being complete.

When the disease has advanced to the

stage of softening, a much longer period is required for recovery. The process is a more complicated one and extensions are more apt to occur.

The time required for recovery also increases in proportion to the amount of tissue involved and the number of organs affected. The more tissue involved and the larger the number of organs involved, the longer it takes for recovery to take place, until a point is reached where recovery is impossible.

When softening has taken place with only a small amount of tissue involved, it takes from one year to eighteen months for complete recovery. When there is softening with a large amount of tissue involved, it takes from two to three years for recovery, and even then the recovery may not be complete.

When large cavities have formed, complete recovery seldom takes place, although good health may be attained. When com-

plete recovery does take place in these cases, it is a matter of many years.

In the slowness of tuberculosis lies its danger. It would not be nearly so fatal were it not so slow. Its victims become impatient and do things which lead to their own destruction because of their impatience.

It is natural for a person to think he is well when he feels well. A consumptive soon improves under treatment. He begins to feel well and look well. Everybody says he looks well.

Gradually the physician's advice loses weight. His counsel is disregarded. After all, may not the doctor be mistaken? Feeling begins to govern the patient's conduct rather than reason.

A little relaxation in the rigorous life at first. A little more later, because no perceptible injury has come from the first. Insidiously the disease goes on, while the patient is lulled into a feeling of security.

Suddenly an intercurrent disease inter-

venes. There is a bad spell for a while. When the storm has subsided, the progress which has been make by the tuberculosis is quite patent.

Again the physician's counsel is sought and his advice accepted. Again the rigorous life is begun. Again improvement sets in. Again come doubt and relaxation. And again another intercurrent disease to mark another milestone in the progress of the consumption.

Many a life has been sacrificed to vacillation in the treatment of tuberculosis. It is all because recovery is so slow. The poor victim cannot keep up his courage to go through with it all.

A person who has tuberculosis should start on his treatment with his mind prepared for a long siege. He should say to himself, "It will take years to save my life, but my life is worth the struggle."

No difference how well he gets and how well he feels, he should not consider him-

self sècure under eight or ten years' test of his cure. He should live a careful methodical life during that time and avoid everything which exhausts the nervous system or severely taxes his physical endurance.

CHAPTER XXXIX

The Prevention of the Spread of Tuberculosis

A CONSOLING corollary of the contagiousness of tuberculosis is the preventability of the disease. What is due to life can be destroyed and exterminated.

Inasmuch as every new case of tuberculosis must be propagated from an old one, it is possible, theoretically at least, to stop the propagation by shutting off the seed-supply. It is true practically this may be a little difficult of execution.

When one considers the widespread existence of tuberculosis throughout the animal kingdom and the many factors which enter into its spread, it does look like a hopeless task to try to stamp it out. At one fell stroke it cannot be done.

In division of the task, however, lies the hope of success. One case can be prevented at a time. Every case prevented means one case less from which seed can come. The task gradually grows smaller.

Even in practice the task is not quite so difficult as it looks. Nature herself does much to prevent the spread of the disease.

The enemies of the tubercle bacillus are everywhere. Outdoors the bacillus can scarcely live. Sunshine, fresh air, and rain destroy it. Constantly the disintegrating forces of nature are at work.

The tubercle bacillus has a twofold existence—that within a host, which is active, and that without a host, which is passive. The active life is the parasitic life; the passive life is the dormant or granary life.

Outside of a host the tubercle bacillus must have the protection of broken-down tissue for maintenance of its viability. If the broken-down tissue becomes too much

disintegrated and the bacillus gets shelled out of the hull, so to speak, it dies.

The matter in which the tubercle bacillus is cachéd is gross at the time when it is given off. It easily can be seen and handled. When it becomes so finely pulverized as to be invisible, it soon becomes sterile.

For the prevention of the spread of tuberculosis it is necessary to deal only with the passive or granary existence of the tubercle bacillus.

The prevention of the spread of tuberculosis therefore resolves itself into sterilizing all tubercular matter as soon as it is given off. Could this be done, the disease would soon become extinct.

Unfortunately it cannot be done at present. There are too many consumptives who are ignorant of the contagious nature of the disease from which they suffer.

Even those who do know that the disease is contagious do not know how to

sterilize broken-down matter. Very few, in fact, know that the contagion resides in this matter.

The first step necessary in the prevention of tuberculosis is to educate the people. This must be done by practical demonstration, however, and not by teaching and preaching.

To tell people that they must sterilize all broken-down tissue is one thing; to show them how to do it is another. Very few, even among intelligent people, learn how to do a thing right from merely being told how to do it.

The poor people, above all, need to be shown what to do and how to do it. In fact, they even should be supplied with the things necessary to do it with.

Well may governments and philanthropists vie with each other in bringing this knowledge to the poor in a practical way. Governments can act through Boards of

Health and philanthropists through dispensaries, hospitals, and sanatoria.

That the spread of tuberculosis can be prevented by proper measures has been amply demonstrated. Wherever anything has been done to prevent the spread of the disease results have been obtained.

In the eighteenth century the kingdom of Naples, which comprised the southern half of Italy and Sicily, was plague-stricken with consumption. So malignant was the disease that even the people recognized its contagious nature.

In 1782 stringent laws were passed in the kingdom for the restriction of the disease. Every case of consumption was registered and quarantined, and places and things which had been contaminated by consumptives were sterilized.

In fifty years the death-rate from consumption in the kingdom diminished so greatly that the law was allowed to fall into desuetude. The doctrine of the con-

tagiousness of tuberculosis even was lost to the medical profession.

England began to open hospitals for consumptives in the early part of the nineteenth century. At that time London and Paris had exactly the same death-rate from consumption.

England added to its beds for consumptives right along. Most of the beds were placed in London. Paris established no beds for consumptives.

In fifty years London's death-rate from consumption went down two-thirds. The death-rate from the disease in Paris remained the same until quite recently.

In Philadelphia and New York the death-rate from consumption has been reduced one-third in about fifteen years by modern preventive measures. In these measures there has been no hardship to any one.

With our present exact knowledge of tuberculosis preventive measures can be

carried out along humane lines. There need be no quarantine and no hardships.

The people must be educated, however, to a better knowledge of the subject. Knowledge will take away fear and bring hope. It also will induce governments and philanthropists to supply the means with which to inaugurate preventive measures.

CHAPTER XL

The Consumptive can Avoid Giving His Disease to Others

CONSUMPTION slowly poisons the nervous system and brings about changes in it which more or less transform the character of the person who has the disease.

The consumptive becomes irritable, selfish, suspicious, and sometimes indifferent about ethics. Often, indeed, his condition borders on insanity.

This altered state comes on very slowly and insidiously. It becomes more pronounced in proportion to the duration of the disease. Always the most striking feature is selfishness.

To protect others often is a matter of indifference to the consumptive. It is inconvenient to do so, and he prefers to do that

which is convenient. Preventive measures attract attention to his disease and he doesn't want to attract attention to it.

But fortunately an incentive to protect others always can be found for the consumptive in his own selfishness. His own recovery depends upon observance of those rules of hygiene which are necessary for the protection of others.

This incentive always can be held out to him truthfully. The rules of hygiene which are necessary for the protection of others are still more necessary for himself because he is nearest to himself.

Recovery from tuberculosis depends largely upon prevention of new implantations. Nature gets rid of the old growth, but new ones come up all the time. The consumptive himself has much to do with this.

As he himself is the source of seed-supply and the center of distribution, he necessarily lives in an atmosphere of contamina-

tion unless he sterilizes all tubercular matter the moment it is given off. If he does not make himself and everything about him sterile, he cannot fail to sow new crops.

When he spits into a handkerchief he necessarily inhales the dried sputum which already is in the handkerchief, for he has to take a deep breath before spitting, and he takes this breath with the handkerchief before his mouth. He soils his fingers and lips and mustache, if he has one, and then mixes tubercular matter with his food.

When he puts a soiled handkerchief in his pocket he contaminates his clothing, and wherever he goes thereafter the slightest agitation of his clothing raises a contaminated atmosphere about him which he must inhale. When he spits recklessly about his room he has to inhale tubercle-laden dust every time he is in it.

Indeed, whenever he offends against the laws of hygiene, he by that much lessens his chances of recovery. He always is

nearest to himself, and necessarily always will suffer most from his own neglect.

He in reality has a double incentive to make himself sterile; his own recovery first, and the protection of others next. He has it in his power to make himself absolutely sterile at all times.

The entire code of hygiene in tuberculosis can be summed up in one word—cleanliness. The consumptive who is immaculately clean cannot reimplant the disease in himself nor convey it to others.

To be clean in tuberculosis, however, means to dispose of every particle of tubercular matter the moment it is given off, and to dispose of it in such a way as to make soiling of hands, mouth, clothing, bedding, furniture, and place impossible. The matter must be deposited either where it can be sterilized at once or destroyed before it can come in contact with anything else.

Tubercular sputum should be deposited

in a cup with a handle. The cup should have a handle in order that it may be held close to the mouth.

There are many kinds of cups in the market, to be had in drug-stores, which may be used. One of the best is a tin cup with a paper cup inside. With this the sputum is deposited in the paper cup and the paper cup is then burned. The tin cup is boiled daily.

For the poor, an ordinary china coffee-cup with a handle is perhaps the cheapest and best. Lye which is used for scrubbing and soap-making and a little water should be put in the cup, and the cup should be emptied and scalded twice or three times a day.

A consumptive should never use a handkerchief or rag to spit in. He not even should use such things to wipe his mouth with.

When he cannot spit into his cup he should spit into a paper napkin, fold up the

napkin carefully, and place it in a paper bag. He always should use a paper napkin to wipe his mouth with, and when he has used the napkin he should place it in the bag. This bag he should burn when he has an accumulation of napkins.

There are in the market, to be had at drug-stores, sputum flasks and heavy paper receptacles which can be carried in the pocket. Any one of these may be used, but they are all much more costly than paper napkins and paper bags.

Men can always carry paper bags and napkins in their coat pockets. Women can carry them in a caba. Paper napkins and bags are inexpensive and do not attract much attention.

A consumptive should be very careful not to let any spit get on his clothing, on bedding, or on the floor. He always should take pains not to soil his hands and lips, and in order to be doubly sure he should wash these frequently.

If by any chance a particle of spit should be deposited anywhere else than in the spit cup or in a paper napkin, it should be taken up at once or sterilized where it is.

For sterilizing spit which has been deposited where it should not have been, lye and water, carbolic acid, or formalin may be used. The best way is to take up the spit and destroy it.

Consumptives with running sores should carefully take up all discharges on absorbent cotton and burn them. Pains should be taken not to permit the discharges to dry and be scattered about, or to soil clothing. The skin about running sores frequently should be washed.

Consumptives should not shake hands nor kiss on the mouth. These customs are dangerous to the well and to themselves. They are dangerous to the well because they may give them consumption ; they are dangerous to themselves because they may give them colds and influenza.

A consumptive should never spit anywhere except into his spit cup or paper napkin. Then he is sure that he controls the contagion which he gives off.

When he has spat he should carefully wipe his mouth with a paper napkin. He soon learns to do all these things without soiling his hands or lips. When he has learned to do them he can console himself with the idea that he is harmless.

Consumptive men with mustaches and beards should shave them off. It is practically impossible for a man with a mustache and whiskers to avoid contaminating them in spitting.

Consumptives should have their own eating and drinking utensils. At least they should see that eating and drinking utensils which they have used are washed before being used by others.

For this last troublesome precaution the consumptive gets nothing in return except the consciousness that he is doing his duty

to his neighbor For all the others he has the return of protecting himself against extension of his disease.

Surely it is worth a sacrifice to prevent another from getting so loathsome a disease. The more so because the protection is most apt to come to some one who is very near and dear.

CHAPTER XLI

The Government in the Prevention of Tuberculosis

IN THE organization of society man has handed over many of his personal rights to government. In matters of life he has retained only the right of self-defense against direct personal attack.

Against dangers from accident and disease he has handed over his right of interference with the conduct of others to the government, which agrees to protect him by regulation of the conduct of all. This the government does in return for the liberties which he gives up.

Governments have been ready enough to protect individuals against accidents, and have passed all kinds of laws for this purpose. They have been slow, however, in

making laws for the protection of the individual against disease.

This no doubt has been due, in part at least, to ignorance of the cause of disease. In knowledge the government is the people. Until relatively recently the people have looked upon disease as a providential visitation.

As knowledge of the real cause of disease comes to the people efforts begin to be made to prevent disease. Expressed in law, these efforts are patchwork, because the knowledge comes piecemeal.

In most countries governments have begun their efforts at prevention of disease by creating Boards of Health. Meagerness of knowledge probably made them do this. They gave the Boards arbitrary powers, because there was not enough knowledge upon the subject for definite laws.

Gradually Boards of Health are evoluting into regular departments of government with clearly defined powers. Definite laws

also are being enacted for the guidance of such departments.

One of the impediments to progress in the evolution of health departments has been the reluctance of people to spend money for the prevention of disease. The people have not yet learned the economical value of health.

For this reason governments have done little for the prevention of tuberculosis. Boards of Health perhaps have not done as much as they should have done to engraft new knowledge upon law.

In very few places indeed has the government as yet given official indorsement to the contagiousness of tuberculosis. Where it has done so, it has done little else.

Gradually, however, the people are becoming educated to a full sense of appreciation of what prevention of a disease like tuberculosis means. With this education will come governmental action.

As governments now are equipped for

prevention of disease, in most places, it would be difficult to carry out a comprehensive scheme for the prevention of tuberculosis.* There are many things, however, which Boards of Health could do.

The first thing which Boards of Health should do is to register all cases of tuberculosis. This would give knowledge of where the danger is which is to be met. Without this knowledge all effort is handicapped.

Some men object to registration on the score of hardship and publicity. There is no hardship, because quarantine is unnecessary. There need be no publicity.

Prevention of tuberculosis does not follow along the lines laid down in the past for the prevention of other diseases. To be effective, it must be along lines of humanity.

The poor consumptive must be looked up for the purpose of extending him aid and not of persecuting him. He can make him-

*Registration of tuberculosis is now practiced in most cities and in many States and countries.

self harmless to others if shown how and supplied with the means of doing it.

Registration would not give any publicity which the disease itself does not give. Consumption cannot be hidden. Its symptoms are too pronounced and too well recognized for that.

Government supervision of consumptives would lessen their hardships by inspiring public confidence. The public would fear the consumptive less if it were certain that he is taking the proper precautions against spreading the disease.

Boards of Health should instruct consumptives and the members of their families in what is to be done for the prevention of the spread of the disease. With the educated and well-to-do this might be done by tracts ; with the ignorant and poor by word of mouth through an agent.

Boards of Health should guarantee protection to fellow-employees of consumptives. A consumptive employee should not

be permitted to continue his employment unless he takes the proper precautions for the protection of others.

Fellow-employees cannot protect themselves. The employer does not know how to protect them or has not the courage to do so. Boards of Health can and should do it.

Boards of Health should sterilize houses, offices, and shops which have been occupied by consumptives. Innocent parties coming into such places have no way of protecting themselves.

When a place which has been occupied by a consumptive has been sterilized, the fact should be so recorded in an open record. This would enable people to assure themselves that places into which they are about to move are free from contamination.

Boards of Health should also sterilize the belongings of consumptives after death before they can fall into the hands of innocent people. Everything which has been

used by a consumptive should be sterilized before it is allowed to be used by any one else.

Well-meaning people often give the personal property of a consumptive to the poor in order that it may not be wasted. Such a gift often carries death with it.

CHAPTER XLII

How to Sterilize Places and Things which Have Been Contaminated by Consumptives

TO sterilize a thing means to destroy all the life that is in it. To sterilize places and things which have been contaminated by consumptives means to remove all the contaminating matter in or upon them or to kill the micro-organisms in the matter.

The contaminating matter in consumption always is broken-down tissue. Sometimes it is called spit or sputum, and sometimes pus or matter. Whatever its name or whencesoever it comes, it always is visible in the beginning.

When it has become finely divided up in the moist or dry state, however, it may escape detection. Small particles of tuber-

cular matter in food or small particles of tubercular dust on a floor or wall cannot be seen.

Tubercular matter which is not sterilized immediately upon being given off, when it easily can be seen and controlled, therefore becomes very troublesome to sterilize when it has been scattered about. It is so difficult to know where it has gone to and what it may have contaminated.

To sterilize a place which has been contaminated by a consumptive is no small matter, therefore. It means either removal of every particle of tubercular matter from the place or killing all the micro-organisms in the matter.

Removal of every particle of tubercular matter involves scraping of walls and washing them down, scrubbing the woodwork and floors, and thoroughly cleaning out every crevice in the place. When a whole house has to be done in this manner it is an expensive procedure.

Killing the micro-organisms in the tubercular matter in a place is not easily accomplished. The broken-down tissue acts as a caché or hull for the tubercle bacilli and protects them. Germicides cannot easily get at them.

The ordinary method of sterilizing a room with sulphur fumes commonly used after certain diseases is therefore not of much value in tuberculosis. The fumes do not penetrate the tubercular matter.

Formaldehyde, which is very penetrating, sterilizes tubercular matter when such matter is finely divided or pulverized. It cannot be depended upon, however, for coarse tubercular matter.

There is much albumin in tubercular matter. Sometimes there also is fibrin. These substances are coagulated and hardened by most of the germicides.

The hardening protects the tubercle bacilli which are on the inside. Matter which has been acted upon by such germi-

cides often is preserved instead of sterilized.

Corrosive sublimate, carbolic acid, and formalin all have this hardening influence on tubercular matter. They are not of much value, therefore, for sterilizing places and things which have been contaminated by consumptives.

For sterilizing places we really have only one reliable method—namely, scrubbing and cleaning. This scrubbing, moreover, must be done with soap and water or lye and water, and not with germicides.

Rooms which have been occupied by consumptives during the dying period of the disease should be thoroughly scraped, scrubbed, repainted, and repapered. They should be renovated in every part.

Rooms which have been occupied by consumptives only occasionally, such as sitting-rooms, parlors, and perhaps dining-rooms, should be thoroughly cleaned and

then filled with formaldehyde. Hallways need merely be cleaned.

In sterilizing with formaldehyde pains should be taken to close all openings in the room and to fill the room to its full capacity. The work had better be done by an expert.

For sterilizing things which have been contaminated heat should be used when possible. Heat is a very convenient germicide for the tubercle bacillus because a very high temperature is not necessary to kill the bacillus.

Small things which can be placed in the bake-oven may be sterilized at home. Only a temperature of two hundred degrees at most is necessary to kill the tubercle bacillus.

Things which can be boiled without injury may be sterilized by boiling. Bedclothes and much of the wearing apparel may be sterilized in this way.

Large things which cannot be subjected

to dry heat at home and cannot be boiled may be sent to a sterilizing plant, if there is one near by. In all large cities and in many towns there are sterilizing plants owned by the government and operated by the Board of Health.

Articles which cannot be subjected to dry heat and cannot be boiled should be carefully cleaned. If they permit of it, they should be thoroughly scrubbed with soap and water. Some things can best be cleaned with a stiff whisk dipped in water.

Whatever is done for the purpose of sterilizing places and things which have been contaminated by consumptives must be done thoroughly. Every particle of tubercular matter must be devitalized or removed.

CHAPTER XLIII

Dispensaries, Hospitals, and Sanatoria for Consumptives

AS society is constituted it is impracticable to stamp out tuberculosis by education alone. With the poor, the ignorant, and the vicious education is not sufficient.

Individual measures for the prevention of tuberculosis, for execution, require means, intelligence, and good disposition. Where any one of these is wanting, the result is vitiated.

Not that individual preventive measures are expensive, intricate, and burdensome; for they are not. At most, they are irksome. But they do cost some money, some thought, and some self-sacrifice.

For a person who always has these three things to spare it is a trifle; for a person

who is always deficient in them it is a tax. The sick poor who have been sick a long time are apt to be short on all three.

A poor consumptive seldom can get the necessaries of life. His brain is badly nourished and ill fitted for thought. His crippled organism struggles for self-preservation and rebels against self-sacrifice.

Who can blame him if he does that which appears best and easiest for himself; if he uses all his means, thought, and energy to save his worn life rather than to protect others !

In the early stages of tuberculosis a little help to the poor often would be all that is necessary to save life. Proper food, a little good advice, and perhaps a little medicine would turn the tide.

This aid can be given best in a dispensary. It must not be an ordinary dispensary, however. It must be a dispensary which gives food, medicine, spit cups, paper napkins, and paper bags, shows how

to use them, shows how to ventilate sleeping quarters—in short, regulates life for the patient.

With this assistance the patient often can go on with his occupation, if not on whole time, at least on part time, and recover his health. When he has recovered, he is still in harness and is a useful citizen.

When the disease is farther advanced, so as to make rest an essential factor in treatment, a sanatorium is the proper place for the poor consumptive. Here he can be brought back to health and trained to habits and methods which make him harmless to others.

In a sanatorium the treatment begins with almost complete rest and ends with a full day's work. The diet is carefully regulated, medication is given when needed, and the patient is trained to a life of moral and physical discipline.

When a patient goes out of a sanatorium restored to health, he goes out as a useful

citizen. He knows how to take care of himself and is able to teach others to take care of themselves and to protect those around them.

Sanatoria not only are useful in saving life directly, but in saving it indirectly by preventing the spread of the disease. Every case which they take out of the home and place of business reduces by that much the source of seed-supply for new cases.

Cases which are advanced beyond the curable stage should be cared for in hospitals. There is nothing so pitiable in human suffering as a poor consumptive lying upon a hard bench in a kitchen waiting for death.

These poor creatures often have no one to minister to their wants except the half-starved woman who cooks, scrubs, and washes for the family. Perhaps it is a mother, perhaps a wife, perhaps a sister, perhaps a daughter.

The kitchen serves as sick-room, sitting-

room, and dining-room as well as kitchen among the poor. It is the place where the whole family lives when not employed or asleep.

The poor dying consumptive usually lies upon a bunk in this room and spits into the coal scuttle, into the stove, or upon the floor. The whole room is contaminated, and the food which is prepared and eaten in it can hardly fail to be mixed with tubercular matter.

To live in a house with a dying consumptive under these circumstances is tantamount to getting an implantation of tuberculosis. Every member of the family gets an implantation. Usually the entire family dies with the disease, slowly but surely, one after another.

If any escape, it is because they develop an immunity and recover. Sometimes the disease leaves those who escape crippled or invalided.

The establishment of dispensaries, sana-

toria, and hospitals for the treatment of the consumptive poor will have to be the chief weapon for beating out the great conflagration tuberculosis. It is the most efficient and the most humane method of dealing with the disease.

What golden fruit for the wealthy philanthropist! He needs but pluck it to be crowned with immortality. The name which goes down to posterity coupled with the stamping out of tuberculosis will live forever.

Governments, too, should do all in their power to establish such institutions. Every city should have dispensaries and hospitals, and every State should have sanatoria.

Governments owe it to their citizens to establish such institutions. They owe it to the sick and to the well. Now that tuberculosis is known to be a preventable disease, it is the duty of governments to prevent it.

CHAPTER XLIV

How to Avoid Getting Consumption

AS YET governments are not doing much for the protection of the individual against consumption. It therefore behooves the individual to inform himself about what to do to protect himself.

The consumptive will not take the initiative in the prevention of tuberculosis. It is not to be expected of him. He follows the promptings of nature in trying to save himself, disregardful of the interests of others.

The disease makes him selfish. It is nature's way of trying to save him. But besides the promptings of nature, he has reason for being selfish in that he is outlawed to humanity and human fellowship.

It is too much to ask the consumptive to bear the entire burden of protection to others. They who ask protection at least should be willing to take part of the burden. In fairness they should assume it all.

If a consumptive is to give up his occupation for the protection of others, he should be supported at the expense of those who are protected. If he is to keep away from those who are well, he should be given some place to go. If he is to use certain things for the protection of others, he should be supplied with the money to buy them with.

It is not fair to say to the consumptive: "I want you to get out of your way of living because you endanger my life; I want you to go away from me because I may get your disease; I want you to buy this and that thing and use it so that I may be protected."

Better to say to him: "Brother, you have a loathsome disease which I don't

want to get. Stop work, go to a sanatorium or hospital, and get well if possible; and if not possible, at least be comfortable. I am well. Let me provide for you in return for the protection which you give me.

"If you must work and continue in the bosom of your family, let me show you how you can make yourself harmless to them and to me. I will buy you all you need to do this with and show you what to do and how to do it."

Could we who are well all agree to act thus toward our stricken brethren, how completely we could protect ourselves and how light would be the burden! It would scarcely cost us two dollars apiece the world over to wipe out consumption.

It is impracticable for us, however, to be united in this work. Too many of us would like to get the benefit without the burden. We are unwilling to contribute our mite.

Until we come together and through our governments provide for the consumptive in a way that will protect us, there is nothing left for us but for each of us to protect himself the best he can. To some extent this is possible.

Individual protection can best be secured by kind attention to those consumptives with whom one must come in contact. There is no danger from the consumptive whom one can see and control.

While the consumptive will not take the initiative in preventive measures, he will cooperate. If told what to do to protect others and helped to do it, he will try. With patient effort usually he can be made to do all that is necessary.

For self-protection the healthy individual, therefore, should kindly and patiently insist that every consumptive with whom he comes in continuous contact shall sterilize all tubercular matter the moment it is given off. If necessary, he should supply him with the

necessary articles for this purpose and show him how to use them.

One should not live in the same room with a consumptive unless the consumptive does sterilize all tubercular matter the moment it is given off. Better to move at any sacrifice than to do so. If all matter is sterilized at once, there is no danger.

One should not use the eating or drinking utensils of a consumptive without first carefully scalding them, or at least washing them with soap and water. Mere rinsing with cold water is not sufficient.

When one receives anything which has been used by a consumptive, it is well to cleanse or sterilize it before using it. If it is something which can be washed, it may be washed with soap and water. If it cannot be washed, it had better be sterilized by high temperature.

One should not shake hands with consumptives nor kiss them on the mouth. Handshaking and kissing outside of one's

immediate family are customs anyhow which are better honored in the breach than in the performance. They are a handy way of swapping diseases.

When one has to change his place of abode, he should take some trouble to inquire into the previous history of the room, office, shop, or house into which he is going to move. If it has been occupied by a consumptive, it is as well not to move in until it has been sterilized.

For protection against casual exposure to consumption all that is necessary is cleanliness in personal habits. One should always wash the hands and face before eating, and one should not eat, drink, nor smoke while in a tubercular environment. One should avoid putting things into the mouth which do not belong there. One should not pick the nose.

Good health enables one to withstand implantation of tubercle bacilli within certain limits. For protection against casual exposure it probably always is sufficient.

Even people in good health, however, sometimes weaken their disease-fighting powers by dissipation and excesses. During such a period of depression implantation may take place if there is proper exposure.

One therefore always should maintain a normal standard of health and avoid depression. The body should be kept up to a strictly physiological standard in the performance of all of its functions. Anything that may congest, inflame, or cripple an organ should be avoided.

Dampness, darkness, bad ventilation, and bad drainage should be carefully avoided in the place of abode, business, or occupation. They all are predisposing causes of tuberculosis, and, like the dust on the weight in a delicately balanced scale, may be the determining factors of a person's getting tuberculosis.

One's bedroom always should be well ventilated and well sunned. Did those who are well live more in the fresh air and sun-

light, there would be fewer consumptives to take fresh-air treatment for their recovery. What helps to cure also helps to keep well.

Care also should be exercised in diet. Many people predispose themselves to consumption by breaking down their digestive systems with unhealthful food or stimulants. A plain substantial diet should be used, and not one which tickles the palate.

CHAPTER XLV

Should Consumptives Marry?

SOME men, in their zeal to save human life, recently have ridden the false theory of heredity of consumption so far as to want to forbid by law marriage to all consumptives. The enactment of such a law would be utterly unwarranted.

Consumption is not inherited. On the contrary, immunity gradually comes to those in whose ancestry the disease has existed.

What immunity the white race enjoys has come to it through heredity. It is to children of consumptive parents that we owe the protection we now possess.

Life, therefore, would not be saved by prohibition of marriage between consumptives. On the contrary, the conserving

power of nature would be handicapped in its operation.

Besides, prohibition of marriage would not prevent consumptives from having offspring. Unnatural laws always defeat themselves.

It merely would put burdens upon the children of consumptives to cripple them in their struggle for existence. It would destroy life instead of saving it.

There is no good reason why consumptives should not marry, so far as the offspring is concerned. There is good reason, however, why they should not marry on their own account.

Celibacy is conducive to recovery from consumption, while married life may be an impediment. It is only the celibate who can devote all his energy, thought, and resources to one cause—that of getting well.

To the woman marriage brings the burdens of motherhood, which often have a peculiarly quickening influence on tubercu-

losis. Many a young consumptive mother gets her shroud shortly after she has purchased the christening frock for her babe.

To the man, too, the duties of married life are a serious impediment to recovery. Many a young man has sacrificed his chances of recovery on the altar of Hymen.

There are times, conditions, and circumstances, however, when marriage lessens the burdens of life. What is gained in this way may more than counterbalance what is risked in the married state.

It then is necessary to consider carefully both sides and choose that which offers the best chance of recovery. If the marriage state is entered upon, however, it should be understood by both parties that everything must be subservient to the recovery of the stricken one.

The fact that tuberculosis is contagious should not be lost sight of in considering the question of marriage. The healthy

party to the marriage contract runs some risk of getting the disease.

The relationship between husband and wife is so intimate that even with great care there may be given opportunity in moments of forgetfulness for conveyance of the disease. Husband and wife, indeed, frequently contract the disease from one another.

A consumptive, therefore, should carefully consider, before marrying, whether he is willing to expose the person whom he is about to marry to the danger of getting his disease. As a matter of honor, he should inform the party of his ailment and of the danger from it.

A person considering the question of marrying a consumptive should carefully weigh the risk and the burdens which he is assuming. Unless he can go into the matter in a spirit of self-sacrifice, he should not take the step.

Even when the consumptive has recovered his physical health there may be

danger to the person whom he marries. He still may be giving off tubercle bacilli.

There are many cases on record where men and women have given the disease to two or three consorts in succession without themselves going under. In such cases there is fair health, but never complete recovery.

Then, too, the dormant disease may again break out after marriage. The burdens and responsibilities of married life may sufficiently depress the system to enable the disease again to get a start.

A healthy person about to marry a consumptive should have all these things before him. If he is willing to take all the chances, to carry the burdens, and to make the necessary sacrifice for the person whom he is about to marry, no one should have a right to interfere.

CHAPTER XLVI

Should a Consumptive Mother Suckle Her Child?

EVERYWHERE nature's laws conspire to preserve the offspring. On all sides we see her beautiful solicitude for the young and helpless.

When disease strikes the mother during the period of total dependence of the child, it rarely hits the child. As a rule, the child comes into the world healthy and well nourished.

The child of a consumptive mother nearly always is born healthy. In exceptional cases the disease has extended to the child by contagion, but in exceptional cases only.

After birth the child of a consumptive mother is beset with danger. It constantly

is exposed to contagion. Its natural custodian is sick, perhaps mentally as well as physically.

Its natural source of food-supply is under an embargo. The machinery which produces the food is crippled. The food itself may be poisoned at the fountain-head.

What is to be done for the best interests of the child under such circumstances? Is it to be suckled by its mother?

This is a question of great import. The answer depends upon many conditions and circumstances.

The agriculturist has had to meet the same issue with cattle. His decision may be accepted as correct, because it is based upon a commercial test. He removes the offspring from the mother.

When it is possible to do so, the child should be given a healthy wet-nurse. If this is done, the child may be kept near the mother, but must be protected against contagion.

When a wet-nurse cannot be had, the next best thing to do is to remove the child from the mother and feed it on cow's milk. Under these circumstances the child should be as little in contact with the mother as possible and never should be fed by her.

If the child must be with the mother and cared for by her, it best had be suckled by her. There is much less danger to the child in this than in artificial feeding.

The milk of a tubercular mother probably has some immunizing qualities. If so, the child may imbibe sufficient immunity with its milk to enable it to withstand small doses of tubercle bacilli.

The mother's milk, moreover, will keep the child in better condition of health than would artificial feeding. There is less danger of indigestion and irritation to the alimentary canal from it than from artificial food.

Artificial feeding often becomes a predisposing cause of consumption in children

by the irritation which it sets up and the malnutrition which it leads to. Bottle-fed babies often are victims of tuberculosis.

There is less danger of tubercle bacilli getting into the system of the infant through suckling than through artificial feeding. The handling of implements for feeding by the consumptive mother contaminates them.

It is quite natural for the mother to taste her baby's food to make sure that it is all right. In doing so she is apt to contaminate the nipple or spoon with which she feeds.

On the mother's side there is some reason, of course, why she should not nurse her child. She needs all the energy she can make for her own recovery, and cannot well spare any for her child.

It may be possible, however, for her to increase her food sufficiently to make up for what she gives to the child. If she will add from one quart to three pints of milk

a day to her diet, she will make up for it.

A woman's capacity for digesting food usually increases during lactation. In a way, this increased capacity for digesting food may redound to her own benefit.

At any rate, experience shows that no injury comes to a consumptive mother from nursing her child if she gets enough of the right kind of food. A consumptive mother suckling her child should drink from four to five quarts of milk a day.

Considering the welfare of both mother and child, probably the safest rule to follow when the child cannot be put away from the mother is to suckle the child until it is strong enough to thrive well on cow's milk. Then the child should be weaned and fed by some one else than the mother.

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